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STATISTICAL REVIEW

Annual Market Study of the
Telecommunications Equipment Industry
by
North American Telecommunications Association

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SCOPE & METHOD

The 1987 NATA Telecommunications Equipment Industry Statistical Review provides a comprehensive, current overview of the business-telephone equipment market in the United States. The findings in the NATA Statistical Review come from the best data available and are grounded in assumptions reflecting trends and developments as reported by a wide range of industry sources. The core market analysis rests on quantative estimates of the following data:

- Manufacturers' annual shipments of PBX and key telephone equipment, measured both in equipment volume and revenues.
- Vendors' sales of new PBX and key equipment to end-users, measured both in equipment volume and revenues.
- Vendors' installed base of PBX and key equipment, referring to the cumulative total of telephone equipment in use, on customers' premises.

NATA's Research department has spent the better part of the year collecting and analyzing primary data and reviewing all recent projections. NATA's primary source for this study include an extensive, formal survey of industry participants, to identify and track current trends and projections. NATA researchers also have reviewed a wide range of industry studies and consulted many independent analysts to ensure that no signifigant aspects of the industry have been overlooked. Except where noted, the data and assumptions in the 1987 NATA Statistical Review are entirely those of NATA.

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October 1987

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EXECUTIVE SUMMARY

INDUSTRY OVERVIEW

Transition to Maturity

The business telephone equipment market appears in 1987 to have matured, leaving behind the volatility of the early divestiture era. The transition began shortly after AT&T's[1] 1984 divestiture of the Bell operating companies (BOCs)[2], and has been characterized by:

- declining industry growth rates in which manufacturer shipments of PBX and key/hybrid products fell to growth rates barely approximating growth in gross national product
- shifts in marketing and distribution structures to achieve product differentiation
- differentation of suppliers based on the marketing of service capabilities and cost-effectiveness
- rising foreign competition through spiraling imports and the relocation of foreign firms in the U.S. market
- rising buyer power and sophistication characterized by the growth of prominent user groups resistant to reflex purchasing of the latest technologies, and
- the rising formation of "spin-off" firms serving the needs of niche markets for voice messaging, call accounting, and other systems and services long overlooked by larger players in the entire market.

Market Effects of the Transition to Maturity

Consolidation/Shifts in Distribution

Consolidation, a trend cited in last year's *NATA Statistical Review*, continued in 1986 and will continue at least through year-end 1987 as manufacturers and vendors exit the market, sell off portions of their businesses, or merge with others. While the pace of outright business failures did appear to decline somewhat in 1986 from 1985 levels, mergers and acquisitions continued at a rapid pace as the remaining manufacturers and vendors sought strategic alliances. The most significant consolidation in 1986 and early 1987 occurred as manufacturers purchased interconnect vendors. This trend signaled the onset of a long-term shift in distribution which, over the next several years, will place increased emphasis on manufacturer direct sales. The purchase of Tel-Plus by Siemens, the purchase of Jarvis by Isoetec, and the interest taken in AIM by NEC are but a few examples of this trend. Also, many manufacturers that distribute primarily through authorized distributors are now offering exclusive territories in an effort to decrease conflict among channels. As the emphasis on direct sales and exclusive territories rises, both wholesalers' and dealers' profits will shrink as manufacturers bypass these traditional outlets in favor of those over which they have more control. Remaining dealers, however, will become more powerful with their suppliers as the pool of independent distributors shrinks.

Effect on Price Levels

Prices, though they firmed somewhat in early 1986, stayed low throughout the remainder of the year as vendors continued cutting prices to gain or maintain market share. Attractive prices in the secondary markets further aggravated downward price pressures as some users replaced existing systems with used rather than new equipment. After 1987, however, both prices and profits should rise to more comfortable levels as attrition and other factors bring supply and demand back to equilibrium.

Vendor Performance

AT&T/the BOCs

The growth in market share for AT&T and the BOCs first noted in the 1985 *NATA Statistical Review* slowed somewhat in 1986. Despite the relatively poor performance of these companies in 1986 and early 1987, the underlying factors favoring their success are still present. The BOCs control the local exchange and

can now jointly market CPE and network services. Even without this advantage, the BOCs, by their sheer size, are well positioned for the long term and are taking steps to strengthen their positions in the CPE market. They are beginning to purchase installed base as well as distribution outlets. BellSouth's purchase of interconnect distributor Universal Communications and Pacific Telesis's purchase of part of Northern Telecom's installed PBX base are clear signals that the BOCs intend to overcome the disjointed CPE marketing efforts of the past and become major players. AT&T is also well positioned. Through an aggressive early retirement program and layoffs, AT&T has made clear efforts to streamline internal operations. With an improved product line, control over the long distance network, and the ability to jointly market CPE and network services, AT&T is potentially well positioned to recover from the losses in market share experienced over the last several years.

Interconnect Industry[3]

Despite continued attrition, numerous mergers, and projected long-term declines in market share, interconnects enjoyed slight growth in market share in 1986. Furthermore, for many interconnect vendors[4], profits have risen, thanks to improved management controls instituted during the intense price competition of the period spanning 1983 to 1985. Additionally, by diversifying their product lines, many interconnects have positioned themselves well to respond to slowing growth rates in their core markets. Those with a sizeable installed base and a broad product line now "farm" that base by selling add-ons and upgrades as users' after-market needs evolve. Many interconnects are also carrying products designed to enhance Centrex functionality and nearly 300 are participating in the distribution of network services through authorized sales agency programs. In response to shifting industry boundaries, some interconnects are branching into areas that have traditionally been within the domain of the computer industry. These interconnects are positioning themselves as "systems integrators," value added resellers that tailor integrated voice and data management solutions to specific applications as defined by users' needs. By positioning themselves as the single point of contact for user office automation needs, these interconnects insulate themselves from fluctuating price levels. This trend reflects the growing awareness among interconnects of two factors: a) the marketing of communications and computer equipment must respond to the integration of their technologies and, b) profit margins are enhanced by a vendor's ability to add value to a product.

SUMMARY OF NATA FINDINGS

Product Markets

Key and Hybrid Systems

Sales of key and hybrid key telephone systems will grow only moderately through 1991. Highest growth in shipments will appear in the market for small key systems as small businesses replace older equipment and take advantage of sophisticated features available with newer electronic systems. At the high end of the market, the encroachment by small digital PBXs that has become evident in 1987 will continue through the foreseeable future.

For key and hybrid systems, 1986 represented a continuation of 1985 performance, with overcrowding and oversupply characterizing the market. Swelling inventories and attempts by foreign manufacturers to gain and maintain cost leadership have contributed again to downward price pressures and, therefore, to low profit margins. Throughout 1987, prices will continue falling. Additionally, there is continuing import penetration and additional price pressure, especially at the low end. This pressure is rising from Korea and Taiwan as suppliers from these countries introduce even more new key systems into a market already saturated and characterized by commodity pricing. At least one BOC, BellSouth, has announced plans to import private-labeled key systems in an effort to differentiate its products. Retail outlets will continue to gain market share through 1991.

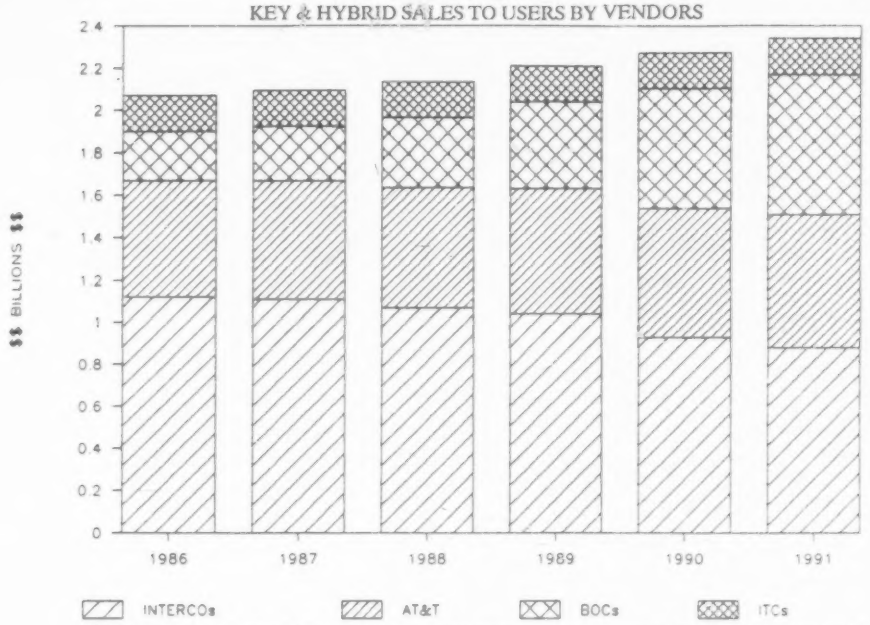
Projections: 1987-1991

- Manufacturers' annual shipments of key and hybrid stations will equal 4.25 million stations in 1987 and will grow to 4.53 million stations in 1991, representing a compound annual growth rate from 1986 to 1991 of 1.5%. Annual shipments of systems will grow to just 532,706 systems over the same period, at a somewhat higher compound annual growth rate of 2.4%, representing a marginal decrease in the average number of stations per system shipped.

- Manufacturers' annual revenues from shipments of key and hybrid equipment will total $965 million in 1987 and will rise to $1.07 billion by 1991, increasing at a 2.2% compound annual growth rate over 1986.

- Vendors' annual revenues from key and hybrid system sales to users will be $2.09 billion in 1987 and

FIGURE 1
KEY & HYBRID SALES TO USERS BY VENDORS



"ITCs" refers to independent telephone operating companies. "Interco" refers to firms active in the "interconnect," or non-carrier affiliated telecommunications equipment industry.

Source: NATA

rise to almost $2.34 billion in 1991, a 2.4% compound annual growth rate from the 1986 level.

- The installed base of key and hybrid stations (including instruments attached to systems either standing alone or serving as adjuncts to PBX or Centrex switches) will grow at a 3.4% compound annual growth rate between 1986 and 1991. The stand-alone portion of this base will grow at a 4.8% compound annual growth rate over the same period.

1986 Performance

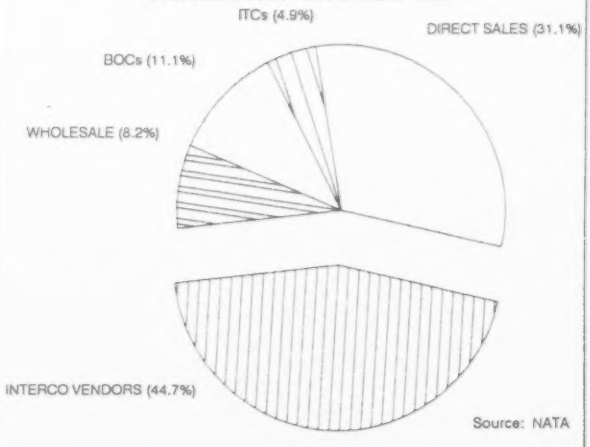
- Manufacturers' annual shipments of key and hybrid equipment grew marginally to 4.19 million stations in 1986, up from 4.15 million stations in 1985. Shipments of systems grew to 466,556 systems, up from 456,044 systems shipped in 1985.

- Manufacturers' annual revenues from shipments of key and hybrid equipment grew to $957 million in 1986, an increase of .2% over the previous year.

- Vendors' annual revenues from sales of key and hybrid systems to end users amounted to an estimated $2.07 billion, up .8% from 1985 levels.

- The installed base of key and hybrid stations (including instruments attached to systems either standing alone or serving as adjuncts to PBX or Centrex switches) grew to 28.9 million in 1986, up 2.5% from the year before. The stand-alone por-

FIGURE 2
KEY & HYBRID SHIPMENTS BY MANUFACTURERS' DISTRIBUTION CHANNEL: 1986



Source: NATA

"Direct Sales" refers to sales made directly to end-users by the direct sales offices of a manufacturer. "ITCs" refers to independent telephone operating companies. "Wholesale" refers to wholesale supply houses. "Interco Vendors" refers to interconnect vendors.

tion of this base grew to 19.6 million stations in 1986, up 4.1% from the 1985 level.

PBX and Centrex Systems

Sales of PBX systems will rise only moderately throughout the remainder of the decade. Sales growth will be greatest in the very large system sizes, as users upgrade outmoded PBXs and replace very large Centrex installations. There will be continued competition in the low end of the market from both Centrex and hybrid key systems and in the high end from Centrex starting in 1988.

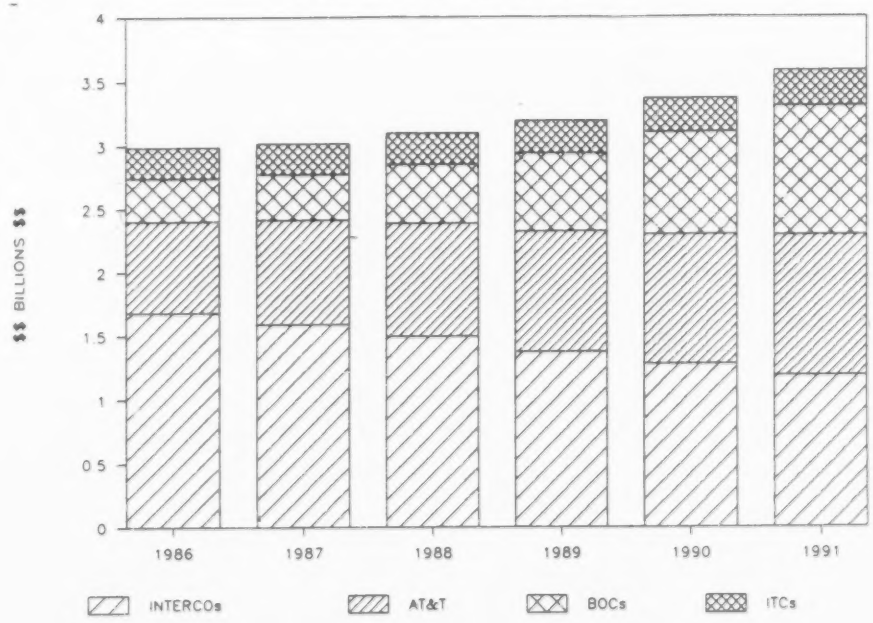
Two factors have contributed to downward price pressures in 1986 and 1987: The PBX market is characterized by oversupply, and some suppliers are reportedly sacrificing profit margins in hope of higher margins on after-market sales to the installed base. After 1987, prices should recover and then rise through 1991 as attrition and other factors cause supply and demand to return to equilibrium.

In contrast to conditions in the PBX equipment market, the market for Centrex services is showing renewed growth as users respond to rate reductions and the telcos' introduction of new features available through the network. By positioning Centrex as the gateway to ISDN services, the BOCs will be increasingly successful at overcoming initial user reluctance to migrate functionality to the central office. At the high end, growth for Centrex services will become significant, beginning in 1988, as large users replace existing PBX and Centrex systems. In 1986, Centrex growth came primarily at the low end of the market.

Projections: 1987-1991

- Manufacturers' annual shipments of PBX equipment will equal 4.2 million stations in 1987 and will grow to 4.9 million stations in 1991, representing a compound annual growth rate from 1986 to 1991 of 3.3% and to 32,225 systems in 1991, in-

FIGURE 3
PBX SALES TO USERS BY VENDORS



"ITCs" refers to independent telephone operating companies. "Interco" refers to firms active in the "interconnect," or non-carrier affiliated telecommunications equipment industry.

Source: NATA

creasing at a 3.8% compound annual growth rate over the same period.

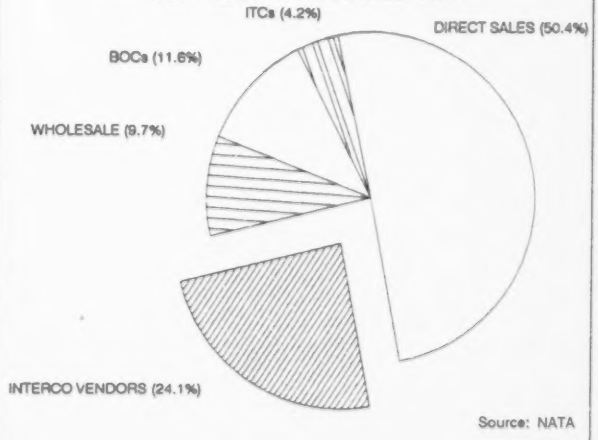
- Manufacturers' annual revenues from shipments of PBX equipment will total $1.24 billion in 1987 and, will grow to $1.57 billion by 1991, increasing at a 5.1% compound annual growth rate between 1986 and 1991.

- Vendors' annual revenues from PBX equipment sales to users will be $3.02 billion in 1987 and will increase to $3.58 billion in 1991, rising at a 3.8% compound annual growth rate from the 1986 level.

- The aggregate installed base of PBX and Centrex stations will grow to 40.8 million by 1991, rising at a 4.6% compound annual growth rate from 1986 figures. The PBX portion of this base will grow to 31.0 million stations by 1991, rising at a 4.9% compound annual growth rate over the same period.

1986 Performance

FIGURE 4
PBX SHIPMENTS BY MANUFACTURERS' DISTRIBUTION CHANNEL: 1986



Source: NATA

"Direct Sales" refers to sales made directly to end-users by the direct sales offices of a manufacturer. "ITCs" refers to independent telephone operating companies. "Wholesale" refers to wholesale supply houses. "Interco Vendors" refers to interconnect vendors.

- Manufacturers' annual shipments of PBX equipment grew marginally to 4.14 million stations in 1986, amounting to a .61% rise over 1985. Shipments of systems declined marginally to 26,710 systems, down .33% from the year before.

- Manufacturers' annual revenues from shipments of PBX equipment grew to $1.22 billion in 1986, representing a .58% increase from the previous year.

- Vendors' annual revenues from sales of PBX systems to end users amounted to an estimated $2.95 billion, up .07% from 1985 levels.

- The aggregate installed base of PBX and Centrex stations grew to 32.55 million in 1986, up 4.6% from the year before. The PBX portion of this base grew to 24.4 million stations in 1986, up 5.2% from the 1985 level.

Distribution Channels

Interconnects

As a group, independent vendors will account for a declining share of annual industry-wide telephone equipment sales as the current round of market consolidation continues throughout the remainder of 1987. Interconnects' actual revenues, however, will remain stable, the result of several factors. First, many individual interconnect firms will realize higher sales volumes and improved profit margins in this more concentrated market environment. As stated in the "Industry Overview" section of this study, growth for these interconnects will come largely through improved management, innovative sales and marketing approaches, and broadened product lines. Second, many vendors will significantly increase the portion of their revenues from after-market activities such as maintenance, moves and changes, upgrades, and enhancements to the installed base. Revenues from after-market activities will offset relative declines in PBX and key/hybrid equipment sales.

Projections: 1987-1991

- Interconnect industry annual revenues from PBX, key, hybrid equipment and related after-market activities market will be $4.1 billion in 1987 and will remain relatively constant through 1991.

- Interconnect industry annual revenues from sales of new PBX, key, and hybrid telephone systems will be $2.7 billion in 1987 and will fall to $2.1 billion in 1991, declining at about a 5% compound annual growth rate between 1986 and 1991.

- Interconnect industry share of total telephone equipment industry annual sales of PBX, key, and hybrid telephone systems will decline from 55.2% in 1986 to 35.4% in 1991.

- Interconnect industry activities from after-market sales (such as maintenance, moves and changes, upgrades, etc.) as a percent of total interconnect industry annual revenues will increase from 32.3% in 1986 to 48.2% in 1991.

1986 Performance

- Interconnect industry annual revenues rose to $4.1 billion in 1986, a 4.5% increase from the 1985 level.

- Interconnect industry annual revenues from sales of new PBX, key, and hybrid telephone systems climbed to $2.8 billion in 1986, a 5.6% increase from the year before.

AT&T

- AT&T, despite heavy losses and an eroding installed rental base in its telephone equipment operations, will see continued improvement in its share of annual PBX and key equipment to end users. AT&T's share is expected to rise from 25.3% in 1986 to 28.8% in 1991.

Bell Operating Companies

- The BOCs will show dramatic growth in annual PBX and key equipment sales to end users, jumping from 11.4% of new sales in 1986 to 28.3% by 1991.

Independent Telephone Operating Companies[5]

- The independent telephone operating companies' share of annual equipment sales to end users will drop from 8.1% in 1986 to about 7.5% by 1991.

PUBLIC POLICY DEVELOPMENTS

Regulatory Developments

Federal regulators continued to play a lead role in the development of industry structure in 1986 and throughout 1987.

FCC Removes BOC Separate Subsidiary Requirements

In late 1986, the Federal Communications Commission (FCC) removed the separate subsidiary requirements for the BOCs' provision of CPE. This, despite arguments by NATA and others for the retention of the separation rules.

The FCC did, however, include five non-structural safeguards as substitutes for separate subsidiaries. NATA led the fight for two of these: The Commission required all BOCs to maintain sales agency programs and non-discriminatory installation and maintenance procedures, including the retention of Centralized Operations Groups (COGs) for interconnect service-order processing.

Other non-structural safeguards adopted by the Commission include accounting procedures for tracking joint and common costs, limitations on the use of customer proprietary network information (CPNI), and timely disclosure of network information, also major areas of NATA activity. Once non-structural safeguards are implemented in early 1988, BOCs may engage in the joint marketing of network services and CPE. In the meantime, several BOCs have sought and obtained permission to engage in some joint marketing before 1988. Independent CPE vendors are apprehensive, asserting that BOCs' joint marketing activities put interconnects at a considerable disadvantage in the marketplace.

To ensure the existence of market checks against the potential anti-competitive behavior of or by the BOCs, NATA sought and won the sales agency requirement. Six of the seven regional BOCs have agreed to the FCC's agency requirement. Only Pacific Telesis (Pac Tel), at this writing, has resisted, appealing to the FCC to accept as the "functional equivalent" of sales agency a vendor liaison program which falls far short of providing a functional equivalency to agency. Pac Tel's plan involves no commissions for unaffiliated vendors and leaves all control to the BOCs. NATA is vigorously resisting Pac Tel's attempt to undermine agency. At this time, nearly 300 unaffiliated CPE vendors are participating in sales agency programs across the country for third-party distribution of network services.

Although the FCC did not impose separate subsidiary requirements on independent telcos, NATA has asked for a partial reconsideration of the separate

subsidiary ruling and has petitioned the FCC to impose COG rules on GTE telcos. NATA maintains that these same rules should apply to GTE firms as well as to the BOCs and asserts that GTE has been using control of local exchange monopolies to discriminate against independent phone vendors.

First Triennial Review of the MFJ by Judge Greene

In September 1987, U.S. District Judge Harold Greene, who presided over the divestiture of AT&T, ruled for the continued enforcement of most of the provisions of the divestiture decree. Judge Greene's ruling came despite Department of Justice arguments that sufficient competitive conditions have emerged to warrant lifting many of the restrictions placed upon the BOCs in the final divestiture decree, the *Modified Final Judgment* (MFJ).

Greene's ruling, in fact, represents a major victory for the competitive equipment industry--and for NATA, which played a lead role in clarifying the competitive industry's concerns. Greene maintained the restrictions on BOC manufacturing of CPE--an issue on which NATA's leadership proved most critical. He also prohibited the BOCs from offering inter-LATA long-distance services. Greene did, however, partially lift the restrictions on the BOCs' offering of information services. The exact scope of the ruling must still be clarified, but the BOCs will be allowed to provide "gateway" functions. Greene also allowed the BOCs to diversify into non-telecommunications-related businesses without filing line-of-business waivers with the court.

Computer III: CEI/ONA

Greene's ruling confuses the extent to which the FCC's CEI/ONA ruling survives. Under *Computer II,* the FCC required AT&T and the BOCs to offer enhanced services through separate subsidiaries to guard against anti-ratepayer cross-subsidies and anti-competitive discrimination.

The Commission, in its May 1986 *Computer III* ruling, preserved the basic/enhanced service dichotomy, but the Commission gave dominant carriers the green light to integrate sales of basic network services and unregulated enhanced services, such as voice-messaging and remote burglar alarms.

Under the new rules, effective February 1988, telcos must submit open network architecture (ONA) plans which detail how they will provide unbundled basic service elements of the network. BOC plans must also indicate how enhanced service providers and customers will be afforded equal network access, or comparably efficient interconnection (CEI). In place of separate subsidiaries, telcos must offer CEI to the network to all suppliers and customers who wish to provide the same services as the telcos. To date, Bell Atlantic and Pacific Telesis have filed plans with the FCC, asking for permission to offer integrated voice-mail services on an interim basis through CEI. To develop their plans, telcos in 1987 have hosted a series of "ONA forums" at which the BOCs and numerous industry representatives have met, under the auspices of Bell Core, for the purpose of identifying what enhanced service providers will require under ONA. (Responsibility for industry-forum-coordination has recently shifted to the Exchange Carriers Standards Association.) Schedules for any comprehensive implementation of CEI/ONA are elusive. The AT&T antitrust decree bans BOCs from providing many enhanced services, called "information services" by the court. The extent to which Judge Greene, in his triennial review of the divestiture, limited the BOCs' entry into information services compounds the uncertainty surrounding CEI and ONA and the extent and means of their implementation.

AT&T Petitions the FCC to Amend Part 68

In early 1987, AT&T petitioned the FCC to amend Part 68 to require all PBXs (apparently including appropriately configured "hybrids") to return "answer supervision" on certain DID calls when the called party answers the call. The petition reportedly came as a result of an AT&T investigation into long-distance toll fraud which revealed that calls placed to PBXs not configured to return "answer supervision" on certain DID calls can go undetected and unbilled. The requirement would apply to all newly registered equipment, and all embedded equipment would also have to be brought into conformity. NATA has already worked to have some of the more far-reaching proposals removed and even to have some equipment grandfathered. But the major issue remains the extent to which embedded equipment will have to be retrofitted.

Legislative Activity

On Capitol Hill, 1987 was a year of major change, with control of the Senate shifting to the Democrats and new players taking control of the Telecommunications Subcommittee in the Senate. Few major legislative initiatives occurred in the telecommunications field, however, in part because the Hill took a "wait and see" approach while Judge Greene conducted the first triennial review of the divestiture agreement. The

most significant activity occurred in the area of trade, with the Congress moving on major trade legislation.

International Trade

Prompted by the political pressures exerted by the expanding balance of trade deficits and the loss of jobs, Congress spent its energies largely on crafting new trade legislation. Both the House and Senate passed comprehensive bills, which, at this writing, were being worked on by one of the largest conference committees in history.

Both measures contain telecommunications sections which attempt to require reciprocity. The Administration would have to negotiate with nations found to have restrictive trade barriers and to retaliate against those that fail to provide U.S. suppliers with equal access to their markets.

NATA has been actively involved in the trade area. In testimony before the House Trade Subcommittee, NATA cautioned against retaliatory tariffs, saying that what is needed is coordinated efforts by the government and private industry designed to make the U.S. industry more competitive.

The Senate's version contains an amendment which would bar the Toshiba Corporation from the U.S. market for at least two years. The provision was added on the Senate floor in the wake of revelations that a subsidiary, Toshiba Machine, Inc., sold sensitive cavitation machinery to the U.S.S.R.. That provision and other more severe anti-Toshiba measures introduced in the House, received enormous attention. The actions of the Toshiba subsidiary drew widespread scorn and became the focus of broader anti-Japanese sentiment brought on in part by the U.S. trade deficit with Japan and its perceived result -- a loss of jobs.

It remains for the House and Senate conferees to resolve the issue at this writing.

In a related matter, the U.S. trade representative (USTR) proposed and subsequently implemented tariffs on a wide array of Japanese electronic products in an attempt to solve serious problems in the semiconductor industry. In testimony presented to the USTR, NATA argued that tariffs of the type proposed could have serious consequences and could unfairly punish U.S. distribution business. Those tariffs were imposed on a scaled-down list of products and remain in effect at this time.

BOC Line of Business Restrictions

The 100th Congress saw the re-introduction of legislation in both the House and the Senate designed to allow the BOCs into manufacturing, long distance, and information services--all lines of businesses prohibited by the AT&T Consent Decree. These measures, which were successfully opposed by NATA, drew little enthusiasm in 1987. Both House and Senate Telecommunications Subcommittees took the position that the entire MFJ was under review by the Court and that Congress should not interfere with the judicial process. At the time of this writing, no action is anticipated for the balance of 1987.

PRODUCT AND MARKET DEFINITIONS

Key and Hybrid Systems

Product Definition

Key telephone systems are multi-line business-communications systems providing users with shared access to a group of external telephone lines through buttons (or keys) located on the telephone set. Typically, each key is associated with a specific outside line, and that line's number appears on the key. When a user presses a key and lifts the telephone receiver off-hook, a circuit is completed and the user receives a dial tone from the telephone company's central office (CO). The buttons on a key telephone generally light up and flash to indicate the status of the line to which the phone is connected. For example, an unlit button indicates an idle line, a slow flash indicates an incoming call, a fast flash indicates a call on hold, and a steady light indicates that the line is in use. This type of network access is referred to as direct line termination, as each incoming line is connected directly to a specific key on the telephone set.

There are three generic types of key telephone systems, distinguished by the technologies incorporated. Electromechanical, or 1A2-type, key systems are the oldest variety--having been introduced in the early 1960s--and until recently were the most prevalent. Electromechanical key systems rely on mechanical switches and relays driven by electric current for their operation. This type of key system typically is feature-poor, offering few call handling features beyond hold and intercom, and is characterized (with some exceptions) by the use of bulky, 25-pair cabling to connect station sets with the main service unit.

Electronic key systems, introduced in the mid-1970s, replace the mechanical switches and relays of the electromechanical type with solid-state, integrated circuits and microprocessors. Electronic key systems typically are highly featured--often providing a range of call-handling features comparable to PBX systems--and are characterized by the use of "skinny-wire" 2- or 4-pair station cabling, rather than the bulky 25-pair cabling commonly associated with electromechanical systems.

Hybrid key systems are the most recent variety, having been introduced in the late 1970s. The designation "hybrid" has caused considerable confusion among users, because vendors use the term to describe highly featured electronic key systems as well as, in some cases, PBX systems designed for very small line-size applications. In this study, hybrid key systems are defined as those combining the network-access characteristics of both traditional key systems and PBX systems--a definition consistent with the current FCC definition of multi-function telephone systems. Hence, true hybrid systems can provide either the direct-line-terminated, one-button-per-line network access characteristic of key systems, or the "dial 9" pooled network access characteristic of PBX systems--with some able to provide both types of network access simultaneously to different station sets. The type of network-access provided is determined by minor hardware or software alterations in the hybrid's service unit.

Hybrids not only incorporate technology intermediate between key and PBX systems, but typically fall into an intermediate line-size category as well. Most traditional key systems support from 2 to 40 stations, with hybrid key systems dominating the 40 to 120 station market, and PBXs comprising the vast majority of systems capable of handling over 120 stations. Of course, these product line-size distinctions are to some extent arbitrary, with hybrid systems overlapping competing products at either end of the 40- to 120-station range.

Product Applications

Key and hybrid systems are primarily voice-communications systems for use in small to medium sized offices--those requiring from 2 to 120 stations sets. These systems provide intraoffice communications links (intercom), shared access to the public switched telephone network and long-distance networks, and limited office-automation functions (such as call accounting).

Key and hybrid systems can serve either as stand-alones or as adjuncts to larger PBX systems or Centrex offerings. As a stand-alone, the key/hybrid, acting as the primary telecommunications system within a small business or a large business branch office, is connected directly to the local telephone company central office. As an adjunct, the key/hybrid is installed alongside a PBX or to Centrex lines, providing users with enhanced access to those switching systems' features, as well as affording greater ease of use than do standard single-line telephone sets.

Competitive Products

Key and hybrid systems face competition from three other products. First, higher line-size systems are seeing encroachment from small digital PBX systems. The prospects for growth at the upper-end of the hybrid market will diminish as these new small line-size PBXs reach the market.

Second, adjunct-key systems are facing competition from the multi-button feature-phones PBX manufacturers are designing specifically for use with their switches. Adjunct-key systems behind PBXs will disappear from the market as more PBX manufacturers introduce such feature-phones and thereby contribute to the replacement of older PBX systems.

Third, stand-alone key and hybrid systems are competing with Centrex services for virtually the entire 7 to 120 stations-per-system market. Inroads by Centrex service into this market have shifted some users away from sophisticated, high-featured key and hybrid systems towards low-tech 1A2-type equivalent adjunct products.

While Centrex services do compete with key and hybrids, an increasing number of these systems are being designed to complement, rather than compete with, Centrex functionality. An entire equipment industry has blossomed to provide Centrex-related services. Some manufacturers have begun to fashion their strategies around providing equipment that complements Centrex service offerings.

PBX AND CENTREX SYSTEMS

Product Definitions

PBX Systems

Private branch exchanges (PBXs) are multi-line business telephone systems providing users with pooled access to a group of external telephone CO lines. PBX systems provide, essentially, the same services as a telephone company central office--dial tone, signaling, and call routing--but on a much smaller scale and typically from equipment located on a customer's premises. A PBX is often referred to as a switch because, like a central office, it automatically establishes and routes (or "switches") calls between the various stations on a user's premises or between an on-premises extension and the public switched network. A distinguishing characteristic of PBX systems is the users' pooled access to outside CO lines. When a user dials "9" or another designated code from an extension, the switch automatically seizes an idle outside line from a pool of available CO lines to complete the call.

Modern PBX systems fall into one of two categories, distinguished by the method used to switch calls within the system. Space-division switches rely on a continuous physical contact being maintained between the two end-points of a communications channel. This physical pathway is supplied either by contact points in a switching matrix or by solid-state semiconductors. Some form of space-division switching is employed in all of the older electromechanical PBX systems, as well as in some newer electronic models. Space-division technology can handle both analog and digital signals.

A time-division PBX, by contrast, maintains no continuous physical contact between end-points of a communications channel. This type of PBX breaks voice signals into discrete sub-units and switches the signals through the system in serial "time slots". Though time-division switching can handle both analog and digital signals, virtually all major time-division systems currently on the market are digital. A notable exception is AT&T's discontinued Dimension PBX. In a digital time-division switch, analog voice-signals are converted to digital bit-streams, and bit-streams from several distinct voice-channels are transmitted over the same physical pathway in serial time-slots repeated at regular intervals. Digital time-division PBX systems can switch both voice and data signals over the same pathway. Digital time-division integrated-voice-and-data PBX systems are expected to largely displace older types of PBX systems over the next several years, due to the rapidly growing importance of office data-communications.

Centrex Service

Centrex is the generic name for a subscriber switching-service offered by local telephone companies to business customers. Centrex service provides businesses with PBX-like features and capabilities directly from the central office, rather than through premises-based PBX equipment. That is, Centrex service is provided from the same local switching center that provides business and residential customers alike with dial tone, local call-routing, and access to long-distance networks. In order to provide Centrex, the local telco dedicates lines and a portion of the CO switch to an individual customer.

Typically, Centrex service consists of three elements: local-exchange access and switching; intercom service, and a package of call-processing features similar to those available from PBX systems. Centrex is generally treated as a regulated service, and prices are usually set in tariffs approved by state regulators--Centrex prices tend to vary from state to state.

Three types of CO switches, distinguished by the technologies they embody, currently provide Centrex service in various parts of the country: electromechanical; stored-program-controlled electronic, and digital.

Electromechanical switches, based on crossbar technology, are the oldest type of CO switches. The Bell companies have largely phased out crossbar switches in areas where Centrex is available, but many independent telcos still use the crossbar variety. Stored-program-controlled electronic switches, especially AT&T's 1A family, are currently the most common vehicle for Centrex. Because their functions are controlled by computer programs, stored-program-controlled switches, larger and faster than the crossbar variety, facilitate feature-enhancement through software upgrades. The newest type of CO switch uses digital switching techniques and possesses sophisticated data-transmission capabilities. The Bell companies have launched an aggressive program to replace virtually all of their existing CO plant with this type of switch, the best-known examples of which are AT&T's No. 5 ESS and Northern Telecom's DMS 100.

Prior to the Bell System breakup, Centrex--confined primarily to the very large business-market (500 stations per system and up)--was declining in the market, the result of a deliberate effort by AT&T. Since divestiture, however, the Bell operating companies have moved aggressively to rejuvenate Centrex services, heavily promoting Centrex in most urban markets. To increase the service's appeal to small businesses, the BOCs have fought for, and won, deep Centrex rate reductions--as well as enhanced feature offerings and lowered minimum line-size restrictions--from state regulators.

Product Applications

Both PBX systems and Centrex services provide primarily voice communications within medium-to-large sized (roughly 120 stations and greater) offices. PBX and Centrex provide intraoffice communication links (intercom), access to the public switched telephone network and long-distance networks, and extensive office-automation functions.

Large, multi-location businesses employ PBX systems and Centrex services as hubs for their own private, intracorporate networks by linking geographically separate office switching systems--either PBX or Centrex--with private lines leased from local and long-distance companies. Private lines are telephone circuits dedicated to the exclusive use of one customer.

Another application for PBX and Centrex customers is shared tenant service (STS). With STS, several businesses in an office building or industrial park share a single large PBX or Centrex installation rather than rely on each business installing its own office communications system. The STS installer/operator (usually either the landlord, a major tenant, or a special vendor) essentially runs its own miniature telephone exchange, furnishing subscribers with access to local and long-distance networks, as well as supplying intercom and other value-added services.

In an effort to overcome user reluctance to migrate functionality to the central office, the BOCs have aggressively marketed new Centrex service offerings. One of these evolving applications for Centrex services is city-wide Centrex. City-wide Centrex allows multiple location business customers with Centrex line- features to communicate across geographic locations, even those served by different central offices, and merges these diverse locations into a single Centrex network.

Another of these applications is Centrex LAN--a private digital communications system that connects computers, terminals, and work stations, allowing users to share these resources and permits simultaneous voice and data transmission.

Competitive Products

PBX systems face two principal competitors in the business switching market. PBX systems compete directly with hybrid key systems in the 40 to 120 stations-per-system market segment. However, hybrids--though having done quite well in this market over the past four to five years--likely will lose market share and be replaced largely by small digital PBX systems over the remainder of the decade. Increasingly, PBX manufacturers are recognizing this growing market opportunity and introducing down-sized digital PBX systems designed specifically for small offices. Users' growing call for integrated data-transmission capabilities should give PBXs eventual domination over this market, leaving hybrid systems confined largely to the 15 to 40 stations-per-system market segment. Still, hybrid manufacturers continue responding to small and medium-sized businesses' demands for sophisticated data and office-automation functions by merging hybrid and PBX technologies.

A more serious competitive threat for PBX systems comes from Centrex services. Renewed growth in Centrex lines since 1983 has significantly cut pre-divestiture projected expansion of PBX shipments and sales. Moreover, steep state-granted rate reductions for Centrex services have increased competitive price pressure on PBX vendors, narrowing already-thin profit margins even further. Especially troubling for PBX vendors is the fact that telcos can offer Centrex service under bundled-rate packages that often include more favorable rates for network access and certain other types of service

(such as foreign-exchange-lines) than are available to PBX users.

In competition with PBX systems, Centrex service boasts such advantages as possible absence of up-front capital costs to users, flexibility in increasing line-size, and system maintenance at the telephone company's central office. Comparative disadvantages associated with Centrex include limited data-transmission capabilities, lack of direct customer control over system configuration and operation, and Centrex's vulnerability to rate increases imposed by state regulators.

Distribution Channels

Manufacturers' Equipment Distribution Channels

The multi-line telephone equipment market encompasses three distinct levels of suppliers. The first level consists of original equipment manufacturers (OEMs) such as IBM/ROLM, Mitel, and NEC, and exclusive OEM distributors such as TIE and Executone. The second level of suppliers consists of wholesale supply houses such as North Supply and Graybar. These companies act as intermediate distribution points between manufacturers and end-user vendors. Wholesalers typically buy equipment in bulk from manufacturers and sell it in smaller lots to vendors, providing warehousing, shipping, and sometimes, financial services to vendors.

The third level is made up of end-user vendors--those companies that sell equipment to, as well as install and maintain it for end-users. End-user vendors consist primarily of third-party interconnect vendors, but also include Bell operating company subsidiaries, independent telephone companies, and business-phone retailers. Some manufacturers and exclusive OEM distributors also sell directly to end-users, though wholesale supply houses as a rule do not.

This three-tiered market structure affords manufacturers a variety of potential outlets for their products, with the choice of particular distribution channels reflecting manufacturers' overall marketing objectives. Some manufacturers, including several of the largest, maintain branch sales offices to market their equipment directly to end-users, a strategy that offers equipment makers a great degree of control over geographic distribution patterns, pricing, and the level of customer support available with their products. However, manufacturer-direct sales also entail the greatest amount of overhead cost for the manufacturer, while another strategy, wholesaling, generally entails the least amount of overhead--but also provides the manufacturer with the least amount of control over sales and support of his product.

Another strategy is for the manufacturer to sell its product to third-party vendors. This type of arrangement generally involves sales at prearranged quotas with volume discounts to vendors, allowing individual vendors to act as authorized dealers of the product within their respective sales areas. Marketing through a third-party vendor generally provides a manufacturer with greater control over the level of marketing and technical support than through wholesalers, but less than through manufacturers' direct-sales offices.

In practice, most manufacturers use a combination of two or even all three of these strategies. The particular channels chosen by a given manufacturer generally reflect strategic choices on such issues as the importance of brand-name recognition, the level of technical and marketing support required by the product, and the desirability of maintaining control over the geographic distribution of vendors.

End-User Vendors

It is useful to distinguish several categories of end-user vendors in addition to those mentioned above. NATA breaks end-user vendors into four distinct groupings, distinguished by their historical roles in the market and, to some extent, by the level of regulation to which they are subject.

First, there are the Bell operating companies, the local-exchange-service providers. The BOCs, divested from AT&T in January 1984, still control some 80 percent of U.S. local-exchange traffic. In November 1986, separate subsidiary requirements were removed and the BOCs were allowed by the FCC to jointly market CPE and network services, provided they comply with certain regulatory safeguards. The second category of end-user vendors, independent telephone companies, includes the United States' approximately 1,400 non-Bell local-exchange companies. These firms have always been exempt from the FCC's separate subsidiary rule and may market equipment in conjunction with their local-exchange services. The third end-user vendor category consists of a single firm, AT&T, former parent of the Bell System. AT&T is not only the United States' largest single equipment manufacturer and supplier, but is also heir to the entire Bell System embedded base of leased equipment. AT&T is also the largest U.S. long-distance service provider. As of September 1985, AT&T was exempted

from the FCC's separate subsidiary requirement, freeing the company to market equipment in tandem with its interexchange long-distance services. The fourth category, historically called "interconnects", includes all non-carrier affiliated vendors. This category includes, in addition to traditional third-party vendors, manufacturers' branch sales offices as well as business-phone retailers.

Distribution of Centrex Services

Centrex services are currently distributed through two channels: the telcos' own sales force, and authorized third-party sales agents. At the urging of NATA, the FCC has established third- party participation in sales agency programs as an essential safeguard and precondition to relief for the BOCs from regulatory restrictions that required marketing of CPE through separate subsidiaries. Before a BOC engages in the joint marketing of CPE and network services, the telco is required to authorize a "reasonable number" of unaffiliated sales agents who will also receive commissions for the sale of Centrex and other network services.

Third-party distribution of Centrex through authorized sales agents provides a market-check against anticompetitive behavior on the part of the BOCs. It also positions participating vendors for marketing their skills in systems-integration, and combining their knowledge of CPE/network capabilities to develop innovative applications and solutions. For telcos, third-party distribution affords an expanded presence within all sectors of the market. Agency also extends participating vendors' base of CPE to include systems installed in conjunction with Centrex services.

PRODUCT MARKETS

KEY AND HYBRID KEY MARKET

Summary

The market for key and hybrid systems will experience a period of only moderate growth through 1991. Manufacturers' annual sales volumes and revenues will also increase only moderately through 1991.

Highest growth for key and hybrid systems shipments will be in the very smallest line-size category (under 7 stations per system) with declines expected for larger line-size segments (over 20 stations per system). Demand for enhanced electronic, voice-only service in the small business segment will remain substantial, keeping shipments of traditional key systems healthy through the foreseeable future, as small-business users upgrade aging 1A2-type systems to feature-rich electronic systems. This segment is also beginning to benefit from the rising demand for low-cost electronic stations for use behind Centrex. However, the market for high-end key systems (those supporting between 60 and 120 stations-per-system) will see erosion from low-end digital PBX systems offering data-transmission and other office-automation capabilities.

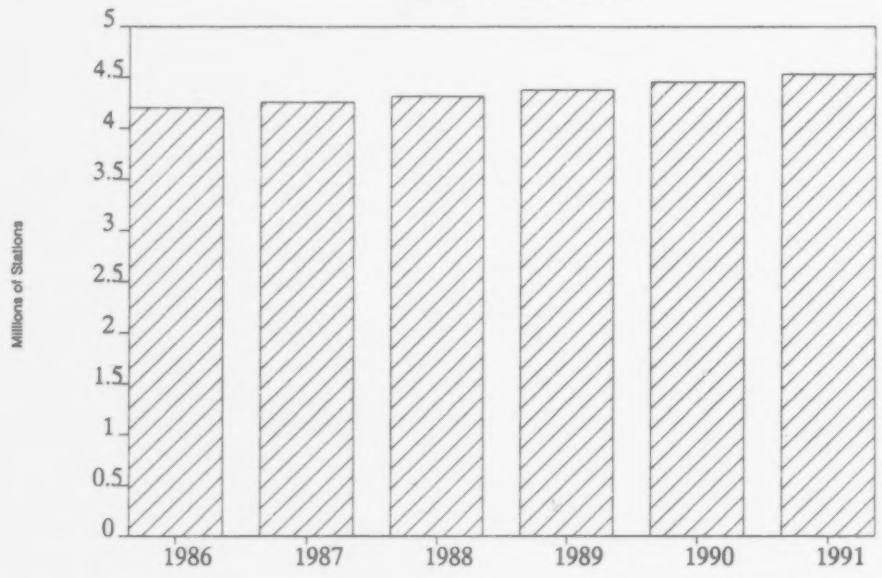
Manufacturers' Shipments and Revenues

- Manufacturers' annual shipments of key and hybrid stations rose to 4.2 million stations in 1986 and will continue growing at a 1.5% compound annual growth rate between 1986 and 1991 to just over 4.5 million stations in 1991.
- Key and hybrid annual systems shipments rose to 466,556 systems in 1986 and will continue climbing at a 2.4% compound annual growth rate between 1986 and 1991 to 532,706 systems in 1991.
- Manufacturers' annual revenues from key and hybrid shipments rose .2%, to $957 million, in 1986 and will continue to rise to $1.07 billion in 1991, increasing at a 2.2% compound annual growth rate between 1986 and 1991.

Shipments by Product Type

- Shipments of electromechanical, 1A2-type key stations declined from just over 25% of total key stations shipped in 1983 to just over 6% in 1986.

FIGURE 5
KEY & HYBRID STATIONS



MANUFACTURERS' SHIPMENTS: 1986-1991

Source: NATA

Table I

KEY & HYBRID MARKET: 1982 - 1986
ESTIMATED MANUFACTURERS' SHIPMENTS

	1982	1983	1984	1985	1986	1982-1986 CAGR*
AT&T						
Stations (000)	1,450	950	1,100	1,105	1,115	-6.5%
% Share	47.5%	28.4%	25.9%	26.6%	26.6%	
Independent Manufacturers						
Stations (000)	1,600	2,400	3,140	3,045	3,084	17.8%
% Share	52.5%	71.6%	74.1%	73.4%	73.5%	
TOTAL						
Stations (000)	3,050	3,350	4,240	4,150	4,199	8.3%
% Growth	5.2%	9.8%	26.6%	-2.1%	1.2%	
$ Mill.	$ 915	$ 921	$1,039	$ 955	$ 957	
Key & Hybrid Systems (000)	354.7	372.2	465.9	456.0	466.6	
Average Stations/System	8.6	9.0	9.1	9.1	9.0	

KEY & HYBRID MARKET: 1987 - 1991
PROJECTED MANUFACTURERS' SHIPMENTS

	1987	1988	1989	1990	1991	1987-1991 CAGR*
AT&T						
Stations (000)	1,131	1,148	1,169	1,191	1,214	1.7%
% Share	26.6%	26.6%	26.7%	26.8%	26.8%	
Independent Manufacturers						
Stations (000)	3,122	3,163	3,208	3,260	3,314	1.5%
% Share	73.4%	73.4%	73.3%	73.2%	73.2%	
TOTAL						
Stations (000)	4,253	4,311	4,377	4,451	4,528	1.5%
% Growth	1.3%	1.4%	1.5%	1.7%	1.7%	
$ Mill.	$ 965	$ 991	$1,020	$1,049	$1,069	
Key & Hybrid Systems (000)	477.9	489.9	503.1	517.6	532.7	
Average Stations/System	8.9	8.8	8.7	8.6	8.5	

Source: NATA

*Compound Annual Growth Rate.

These tables show estimated total shipments of key and hybrid telephone equipment at the original equipment manufacturers' (OEM) level intended for U.S. markets, including imports. "Independent Manufacturers" refers to all non-AT&T suppliers. Estimated shipments include systems destined for installation behind PBX systems and Centrex service, as well as those configured as stand-alone systems.

- Shipments in the 1A2-type key market will continue to decline to under 3% of shipments by 1991. The 1A2-type market segment will serve primarily as a parts market for installed systems for the next several years.

- Electronic and hybrid systems shipments increased at an almost 25% compound annual growth rate between 1983 and 1986, and are expected nearly to replace 1A2-type equipment shipments by 1991.

Shipments by Application

- Manufacturers' shipments of key equipment for use as adjuncts to PBX systems and/or Centrex service have been declining steadily over the past several years as proprietary feature-phones take over the traditional role of adjunct-key equipment behind PBXs.

- Adjunct key equipment declined from over 33% of total key and hybrid station shipments in 1983 to 27% in 1986 and will fall to 24% by 1991.

- While adjunct key equipment shipments will continue to decline as a percentage of total key and hybrid shipments, the actual number of stations shipped will stabilize in 1988, at slightly over 1 million stations, and will remain relatively stable through 1991.

- In contrast to the adjunct key market, shipments of key systems destined for stand-alone applications rose from 67% of total shipments in 1983, to 73% in 1986, and will rise to 76% of shipments in 1991.

Shipments by Line-Size

- Highest growth for key and hybrid system shipments will be in the very smallest line-size category (under 7 stations per system).

- Shipments will decline in higher line-sizes because of encroachment by small digital PBXs on the hybrid market. Falling prices will make small digital systems an increasingly attractive alternative.

- The average number of key/hybrid stations-per-system grew steadily during the early 1980s as a result of increased sales of larger line-size hybrid systems. Between 1982 and 1985, the average rose to 9.1, but fell back to 9.0 stations per system in 1986.

- The station-to-systems ratio for key and hybrid equipment shipments is expected to decline steadily through 1991 to 8.5 stations per system.

User Replacement Rates

An important consideration when measuring net market growth is "churn"--the rate at which users replace installed equipment.

Churn as a Percentage of Annual Shipments

- In the mid-to-late 1970s, 75% to 80% of annual key and hybrid shipments sold were replacements for older systems.

- Churn continues to account for the largest portion of key/hybrid sales. The 1984 product glut and ensuing price war further stimulated already-high replacement rates for older in-place key and hybrid equipment.

- The portion of annual key and hybrid shipments sold as replacements peaked in 1985, with an estimated 86% of new key and hybrid equipment shipped that year for replacement purposes. Annual shipments intended as replacements will decline to 73% by 1991.

Churn as the Percentage of the Installed Base

- Replacement rates peaked in 1984, when nearly 13.5% of the installed base was supplanted by newer systems.

- User annual replacement rates for all key and hybrid equipment fell to 12.45% in 1986 and will decline steadily, to 10% in 1991.

- Electromechanical, 1A2-type systems fell to less than one-half the installed base in 1985 but continue to represent the largest pool of replaceable equipment. As the installed base of 1A2-type systems declines through the rest of the decade, annual replacement rates for the total installed base will also decline.

- Annual replacements of the stand-alone portion of the installed base of key and hybrid systems will decline from an estimated 12.6% in 1984 to 9.8% in 1991.

- Annual replacement rates of the adjunct key-system portion of the installed base will decline from a high of 15% in 1984 to 11% in 1991.

Manufacturers' Distribution Channels and End-User Sales

For an explanation of the distinction between manufacturers' distribution channels and end-user vendor sales, refer to the "Product and Market Descriptions" section of this study.

Table II

KEY & HYBRID SHIPMENTS BY MANUFACTURERS' DISTRIBUTION CHANNEL: 1986		
	Stations (000)	% Share
Manufacturer Direct	1,307	31.1%
Interconnect Vendors	1,877	44.7%
Wholesale Supply Houses	343	8.2%
Bell Operating Companies	466	11.1%
Independent Operating Companies	206	4.9%
TOTAL	4,199	100.0%

Source: NATA

Manufacturers' Distribution Channels

Among all manufacturer distribution channels, manufacturer-direct sales and shipments to the BOCs are expected to grow the fastest over the coming five years. That growth will come at the expense of interconnects and supply houses. The BOCs are expected to recapture much of their historically dominant share of the key system market. And, retail outlets will capture an increasing share of manufacturers' shipments at the low end of the key systems market.

- Manufacturers' direct sales accounted for 31.1% of key and hybrid shipments in 1986, up from 29.3% in 1985.
- Manufacturers' shipments to the BOCs represented 11.1% of total shipments in 1986, up slightly from 10.96% in 1985.
- Despite projected long-term declines, shipments to interconnect vendors did rise in 1986 to 44.7%, up from 42.7% in 1985.
- Shipments to wholesale supply houses declined to 8.2% of the total in 1986, down from 11.45% in 1985.
- Shipments to independent telcos amounted to 4.9% of total shipments in 1986, down from 5.57% in 1985.

End-User Sales

Revenues From Sales to End-Users

- Vendor sales of key and hybrid equipment to end users stood at an estimated $2.07 billion in 1986, up .78% from 1985.
- Vendors' annual revenues from sales to end users will increase at a 2.4% compound annual growth rate between 1986 and 1991, to $2.34 billion.
- The average price per station fell slightly, to about $493 per station in 1986, but will grow to about $517 per station in 1991.

End-User Vendor Shares

Interconnect and independent telco shares of sales to end users are projected to drop, while the BOCs' share is projected to rise over the remainder of the decade.

Table III

KEY & HYBRID SALES TO END USERS BY VENDOR CATEGORY: 1986 & 1991

	1986			1991		
	Stations (000)	Dollars ($ Mill)	Share (%)	Stations (000)	Dollars ($ Mill)	Share (%)
Interconnects	2,271	$1,120	54.1%	1,707	$ 882	37.7%
AT&T	1,115	$ 550	26.6%	1,214	$ 628	26.8%
Bell Operating Companies	469	$ 230	11.1%	1,277	$ 660	28.2%
Independent Operating Companies	344	$ 170	8.2%	330	$ 171	7.3%
TOTAL	4,199	2,070	100%	4,528	$2,341	100%

Source: NATA

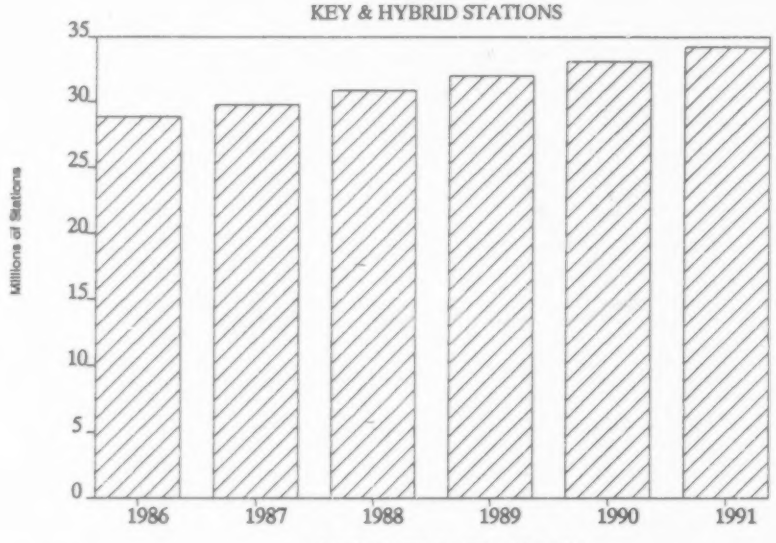
- Interconnect market share is projected to drop from 54.1% in 1986 to 37.7% in 1991.
- Independent telcos' share will decline from 8.2% in 1986 to 7.3% over that period.
- AT&T's share will remain relatively constant at between 26 and 27% through 1991.
- The BOCs' share is expected to jump from 11.1% in 1986 to 28.2% in 1991.

replaced, the installed base will consist increasingly of stand-alone, electronic equipment.

Installed Base by Product Type

- Electromechanical key equipment declined from 44% of the key/hybrid installed base in 1985 to 32% in 1986 and will account for only 11% of the base in 1991.
- Electronic key and hybrid equipment increased from 56% of the key/hybrid installed base in 1985 to 68% in 1986 and will account for 89% of the installed base in 1991.

FIGURE 6
KEY & HYBRID STATIONS



INSTALLED BASE: 1986-1991

Source: NATA

Installed Base

- The total installed base of key and hybrid key stations (including both stand-alone and adjunct key equipment) increased 2.4% in 1986 to 28.9 million stations, will grow to 29.8 million stations in 1987, and continue growing at a 3.4% compound annual growth rate between 1986 and 1991 to 34.2 million stations in 1991.
- The total number of key and hybrid systems grew by 2.4% in 1986, rising to 5.3 million, and will increase to 5.4 million in 1987 and continue growing by a 3.5% compound annual growth rate between 1986 and 1991, to 6.3 million systems in 1991.
- As electromechanical and adjunct key systems are

Installed Base by Application

- The stand-alone portion of the total installed base increased 4.1% in 1986, to 19.6 million stations, will grow to 20.5 million stations in 1987, and will continue climbing at a 4.8% compound annual growth rate between 1986 and 1991, to 24.8 million stations in 1991.
- The number of stand-alone systems grew by 4.1% in 1986, to 3.1 million systems, will reach 3.3 million in 1987, and will continue climbing at a 5.4% compound annual growth rate between 1986 and 1991, increasing to 4.1 million systems in 1991.

Table IV

KEY & HYBRID TELEPHONE MARKET: 1982 - 1986
INSTALLED BASE DEVELOPMENT

	1982	1983	1984	1985	1986	1982-1986 CAGR*
STAND-ALONE KEY & HYBRID						
Bell Operating Companies						
Stations (000)	12,773	11,350	241	556	880	†
% Growth	1.1%	-11.1%	†	130.7%	58.2%	
% Share	76.2%	65.6%	1.3%	2.9%	4.5%	
Independent Operating Companies						
Stations (000)	1,786	1,833	2,055	2,091	2,096	4.1%
% Growth	2.6%	2.6%	12.1%	1.8%	.24%	
% Share	10.7%	10.6%	11.4%	11.1%	10.7%	
AT&T						
Stations (000)	N/A	650	11,120	10,504	10,010	†
% Growth			†	-5.5%	-4.7%	
% Share		3.8%	61.5%	55.9%	51.1%	
Interconnects						
Stations (000)	2,190	3,465	4,666	5,649	6,589	31.7%
% Growth	33.9%	58.2%	34.7%	21.1%	16.6%	
% Share	13.1%	20.0%	25.8%	30.1%	33.7%	
TOTAL STAND-ALONE KEY AND HYBRID						
Stations (000)	16,749	17,298	18,082	18,800	19,575	2.8%
% Growth	4.6%	3.3%	4.5%	3.9%	4.1%	
Systems (000)	2,745.7	2,799.0	2,916.5	3,017.7	3,142.0	3.4%
Average Stations/System	6.1	6.2	6.2	6..2	6.2	
ADJUNCT KEY						
Stations (000)	9,772	9,730	9,543	9,386	9,300	-1.2%
% Growth	-0.4%	-0.4%	-1.9%	-1.7%	-.9%	
Systems (000)	2,220.9	2,211.4	2,168.9	2,133.2	2,114.0	-1.2%
Average Stations/System	4.4	4.4	4.4	4.4	4.4	
TOTAL KEY & HYBRID						
Stations (000)	26,521	27,028	27,625	28,186	28,874	2.1%
% Growth	2.7%	1.9%	2.2%	2.0%	2.4%	
Systems (000)	4,966.6	5,010.4	5,085.4	5,150.9	5,259.4	1.4%
Average Stations/System	5.3	5.4	5.4	5.5	5.5	

Source: NATA

*Compound Annual Growth Rate.

†Growth rates for the Bell operating companies (BOCs) and AT&T are not shown for 1984 because of the transfer of the embedded base from the BOCs to AT&T. Growth for the independent operating companies is artificially inflated in 1984 due to the shift of Southern New England Telephone (SNET) and Cincinnati Bell (CBI) into that category. Similarly, compound annual growth rates are not shown for the BOCs or AT&T because of distortions caused by the transfer of the installed base.

Table IV

KEY & HYBRID TELEPHONE MARKET: 1987 - 1991
INSTALLED BASE PROJECTIONS

	1987	1988	1989	1990	1991	1987-1991 CAGR*
STAND-ALONE KEY & HYBRID						
Bell Operating Companies						
Stations (000)	1,243	1,699	2,196	2,862	3,616	30.6%
% Growth	41.3%	36.7%	29.3%	30.3%	26.3%	
% Share	6.1%	7.9%	9.7%	12.1%	14.6%	
Independent Operating Companies						
Stations (000)	2,105	2,114	2,122	2,127	2,132	.3%
% Growth	.4%	.4%	.4%	.2%	.3%	
% Share	10.3%	9.8%	9.4%	9.0%	8.6%	
AT&T						
Stations (000)	9,709	9,622	9,666	9,689	9,721	.03%
% Growth	-3.0%	-0.9%	0.5%	0.2%	0.3%	
% Share	47.4%	44.6%	42.6%	40.8%	39.3%	
Interconnects						
Stations (000)	7,434	8,137	8,699	9,054	9,287	5.7%
% Growth	12.8%	9.5%	6.9%	4.1%	2.6%	
% Share	36.3%	37.7%	38.4%	38.2%	37.5%	
TOTAL STAND-ALONE KEY AND HYBRID						
Stations (000)	20,491	21,573	22,682	23,732	24,756	4.8%
% Growth	4.7%	5.3%	5.2%	4.6%	4.3%	
Systems (000)	3,305.0	3,508.0	3,718.0	3,923.0	4,092.0	5.4%
Average Stations/System	6.2	6.2	6.1	6.1	6.1	
ADJUNCT KEY						
Stations (000)	9,278	9,287	9,318	9,383	9,475	.5%
% Growth	-0.2%	0.1%	0.3%	.7%	1.0%	
Systems (000)	2,109.0	2,111.0	2,118.0	2,133.0	2,153.0	
Average Stations/System	4.4	4.4	4.4	4.4	4.4	
TOTAL KEY & HYBRID STATIONS						
(000)	29,769	30,859	32,000	33,115	34,231	3.5%
% Growth	3.1%	3.7%	3.7%	3.5%	3.4%	
Systems (000)	5,412.5	5,620.9	5,839.4	6,054.0	6,269.4	3.6%
Average Stations/System	5.5	5.5	5.5	5.5	5.5	

Source: NATA

"Installed base" refers to the cumulative total of equipment in use at the end of each calendar year. "Stand-alone" refers to key and hybrid systems connected directly to telephone company central-office lines. "Adjunct" refers to key equipment connected behind a PBX system or Centrex service.

The 22 wholly owned BOCs were divested by AT&T on January 1, 1984, and were regrouped into seven independent regional companies. At the time of divestiture, the BOCs' entire installed base of key and hybrid equipment was transferred to AT&T. Two companies historically counted as part of the Bell System, SNET and CBI, were not included in the AT&T divestiture and their installed base was transferred to the "independent operating company" category in the 1984 column.

- The adjunct key portion of the total installed base declined .91% in 1986, to 9.3 million stations, and will decline to 9.28 million stations in 1987, after which this portion will grow marginally through 1991.

- The number of adjunct key systems decreased by .91% in 1986, to 2.114 million systems, and will decline marginally to 2.109 million systems in 1987, after which it will grow marginally through 1991.

The Installed Base by System Size

- In the installed base, the average number of stations per system has increased from about 5.3 in 1981 to 5.5 in 1986 and is expected to remain stable through 1991.

- The stand-alone installed base averaged 6.2 stations per system in 1986.

- The adjunct key installed base averaged 4.4 stations per system in 1986.

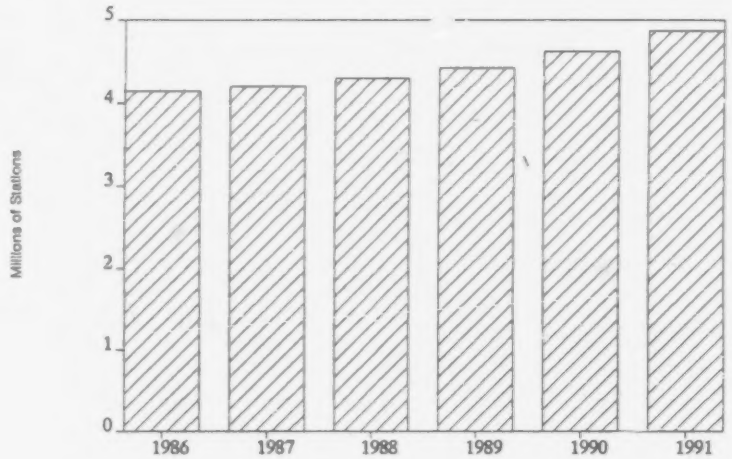
renewed competition from Centrex services at the high end (over 500 stations per system) beginning in early 1988. Market exits by marginal manufacturers continued in 1986 and will continue through the balance of 1987. Prices and aggregate profit margins continued to decline somewhat in 1986 but are expected to rise to more comfortable levels by 1991.

Manufacturers' Shipments and Revenues

- PBX manufacturers' annual shipments grew .61% in 1986 to 4.14 million stations, and are projected at just under 4.2 million stations in 1987. Shipments will increase at a 3.3% compound annual growth rate between 1986 and 1991, to 4.9 million stations shipped in 1991.

- PBX manufacturers' annual system shipments declined marginally by .33% to 26,710 systems in 1986 and are projected at 26,834 systems shipped in 1987. Shipments will increase at a 3.8% compound annual growth rate between 1986 and 1991, to 32,225 systems shipped in 1991.

FIGURE 7
PBX STATIONS



MANUFACTURERS' SHIPMENTS: 1986-1991

Source: NATA

PBX AND CENTREX MARKET

Summary

The PBX market suffered from leveling demand in 1986, growing only marginally over 1985 levels. Only moderate growth is projected for the PBX market through the end of the decade, with continued competition at the low end (under 100 lines per system) from both Centrex services and hybrid key systems and

- PBX manufacturers' annual revenues were $1.22 billion in 1986, an increase of .61% over 1985. They are expected to reach $1.24 billion in 1987 and will continue growing at a 5.1% compound annual growth rate between 1986 and 1991, reaching $1.57 billion in 1991.

- Growth in the number of Centrex stations in use is cutting into potential growth rates for both PBX and hybrid key shipments.

Table V

PBX MARKET: 1982 - 1986
ESTIMATED MANUFACTURERS' SHIPMENTS

	1982	1983	1984	1985	1986	1982-1986 CAGR*
AT&T						
Stations (000)	1,000	800	955	1,150	994	-.09%
% Share	32.5%	24.5%	25.2%	27.9%	24.01%	
Independent Manufacturers						
Stations (000)	2,080	2,470	2,835	2,965	3,146	10.9%
% Share	67.5%	75.5%	74.8%	72.1%	76.0%	
TOTAL						
Stations (000)	3,080	3,270	3,790	4,115	4,140	7.6%
% Growth	7.5%	6.2%	15.9%	8.6%	.61%	
$ Mill.	$1,026	$1,092	$1,175	$1,214	$1,221	
PBX Systems (000)	25.0	25.2	26.1	26.8	26.7	
Average Stations/System	123	130	145	153	155	

PBX MARKET: 1987 - 1991
PROJECTED MANUFACTURERS' SHIPMENTS

	1987	1988	1989	1990	1991	1987-1991 CAGR*
AT&T						
Stations (000)	1,142	1,235	1,309	1,401	1,497	7.0%
% Share	27.2%	28.7%	29.6%	30.3%	30.7%	
Independent Manufacturers						
Stations (000)	3,057	3,063	3,112	3,223	3,337	2.2%
% Share	72.8%	71.3%	70.4%	69.7%	69.3%	
TOTAL						
Stations (000)	4,199	4,298	4,421	4,624	4,874	3.8%
% Growth	1.4%	2.4%	2.9%	4.6%	5.4%	
$ Mill.	$1,235	$1,272	$1,348	$1,457	$1,565	
PBX Systems (000)	26.8	27.7	28.6	30.2	32.2	
Average Stations/System	157	155	155	153	151	

Source: NATA

*Compound Annual Growth Rate.

These tables show estimates of total PBX equipment shipments at the original equipment manufacturers' (OEM) level intended for U.S. markets, including imports. "Independent Manufacturers" includes all non-AT&T suppliers.

Shipments by Product Type

- Manufacturers' shipments of analog, space-division PBX equipment represented 9.1% of total PBX stations shipped in 1986, down from 10.7% in 1985.

- The analog share of PBX shipments will decline steadily to approximately 3% of total PBX shipments by 1991.

- End-user demand for PBX data lines (extensions dedicated to data transmission within an integrated voice-data PBX system) has been slower to develop than some early projections anticipated.

- PBX data lines made up between 5 and 6% of total PBX stations shipped in 1986. PBX data-line shipments will grow by 20 to 25% annually through 1991, but will amount to no more than 9 or 10% of total PBX stations shipped annually.

Shipments by Line-Size

- PBX shipment growth will be highest in the very large line-sizes and weakest in the 100 to 400 stations-per-system range. The 100 to 400 stations-per-system market has been targeted so heavily by manufacturers and vendors that it offers little potential for continued replacement activity.

- Net Centrex installed-line defections to CPE in the large (over 1,000 stations-per-system) line-size market have slowed and are expected to level off in 1987.

- After 1988, however, Centrex will begin to recapture market share from PBXs in the higher line-sizes. The BOCs, in promoting Centrex as a "gateway" to integrated services digital network (ISDN) services are positioning Centrex as the preeminent "high-tech" offering for the 1990s.

- The very large PBX market, despite increasing competition from Centrex beginning about 1988, will benefit from rapid replacement of older-technology PBXs and aging Centrex installations by new, integrated voice/data PBX systems.

- Centrex is currently growing fastest in the small line-size (under 100 stations-per-system) market.

- However, the under-100-stations-per-system PBX market should see strong growth. Since PBX products will continue to compete with hybrid key systems in the market through 1991, the high growth expected for this segment will be shared by both types of equipment.

- The average number of PBX stations per new system shipped--having grown steadily since 1982, because of PBX displacements of very large Centrex installations--will continue rising, from 155 stations per new system in 1986, to about 157 stations-per-system in 1987.

- After 1987, the average number of PBX stations per system shipped will decline slowly to about 151 in 1991. This pattern of fluctuation will result from initial leveling off of large Centrex installations through the remainder of 1987 followed by renewed Centrex growth at the high end around 1988.

User Replacement Rates

An important consideration when measuring net market growth is churn--the rate at which users replace installed equipment.

Churn as a Percentage of Annual Shipments

- User replacements of older PBX systems accounted for 68.2% of all new PBX station shipments in 1986, up slightly from 67.5% in 1985.

- PBX shipments intended as replacements will decline as a percentage of total PBX shipments through 1991.

Churn as the Percentage of the Installed Base

- Users replaced an estimated 12.7% of in-place PBX stations in 1986, down from 13.1% in 1985.

- User replacement of existing PBX stations in the installed base will average about 12% annually between 1987 and 1991.

Manufacturers' Distribution Channels and End-User Sales

Manufacturers' Distribution Channels

For an explanation of the distinction between manufacturer distribution channels and end-user vendor sales, refer to the "Product and Market Descriptions" section of this study.

Manufacturers' shipments to their own direct sales forces and to the BOCs will grow the fastest over the next coming five years, at the expense of interconnect vendors and supply houses.

- Manufacturers' annual shipments to their own direct sales forces accounted for 50.4% in 1986, up from 48.5% in 1985.

Table VI

PBX SHIPMENTS BY MANUFACTURERS' DISTRIBUTION CHANNEL: 1986

	Stations (000)	% Share
Manufacturer Direct	2,087	50.4%
Interconnect Vendors	998	24.1%
Wholesale Supply Houses	404	9.7%
Bell Operating Companies	479	11.6%
Independent Operating Companies	172	4.2%
TOTAL	4,140	100.0%

Source: NATA

- Shipments to the BOCs increased marginally from 10.4% in 1985 to 11.6% in 1986.
- Shipments to interconnect vendors declined to 24.1% in 1986, down from 25.0% in 1985.
- Manufacturers' annual shipments to supply houses in 1986 accounted for 9.7% of total shipments, down from 10.6% in 1985.
- The independent telco share in shipments declined from 5.5% in 1985 to 4.2% in 1986.

End-User Sales

Revenues From Sales to End-Users

- Vendors' annual revenues from PBX sales to end users increased from $2.98 billion in 1985 to $2.99 billion in 1986 and will rise at a 3.8% compound annual growth rate between 1986 and 1991, to $3.66 billion in 1991.
- Telco annual revenues from Centrex services will grow from an estimated $1.8 billion in 1986 to $2.2 billion in 1991. These revenue estimates include only telco revenues from Centrex bundled rate line-features.
- The average price-per-station for PBX equipment fell in 1986--to an average of $721 per station--and is projected to fall in 1987 to an average of $718; after 1987, prices are expected to rise, to an average of $735 per-line by 1991.

End-User Vendor Shares

The BOCs and AT&T are expected to capture an increasing percentage of PBX sales to end users at the expense of interconnects and independent telcos.

- The BOCs' share of PBX sales will surge from 11.6% in 1986 to 28.4% between 1986 and 1991.
- AT&T's share of PBX sales will rise from 24% in 1986 to 30.7% in 1991.

Table VII

PBX SALES TO END USERS BY VENDOR CATEGORY: 1986 & 1991

	1986			1991		
	Stations (000)	Dollars ($ Mill)	Share %	Stations (000)	Dollars ($ Mill)	Share %
Interconnects	2,334	$1,683	56.4%	1,617	$1,188	33.2%
AT&T	994	$ 717	24.0%	1,497	$1,100	30.7%
Bell Operating Companies	479	$ 345	11.6%	1,385	$1,018	28.4%
Independent Operating Companies	333	$ 240	8.0%	375	$ 276	7.7%
TOTAL	4,140	$2,985	100%	4,874	$3,582	100%

Source: NATA

- Interconnects' share of PBX sales to end users will decline from 56.4% of total industry sales in 1986 to 33.2% in 1991.

- Independent telco share of PBX sales will fall from 8% in 1986 to 7.7% in 1991.

Installed Base

Total PBX/Centrex Installed Base

- The combined PBX/Centrex installed base increased by 4.6% in 1986 to 32.6 million stations and is projected to increase to 40.8 million stations by 1991, rising at a 4.6% compound annual growth rate between 1986 and 1991.

PBX Installed Base

- The PBX installed base grew by 5.2% in 1986, to 24.4 million stations, and is expected to reach 25.7 million stations in 1987. The PBX installed base will increase at a 4.9% compound annual growth rate between 1986 and 1991 to 31.0 million stations in 1991.

- The installed base of PBX systems rose 4.2% to 221,636 systems in 1986, and will rise to 280,479 systems in 1991, increasing at a 4.8% compound annual growth rate between 1986 and 1991.

- Digital, time-division PBXs, though constituting the bulk of new PBX shipments in 1986, accounted for only about 40% of the PBX installed base in that year.

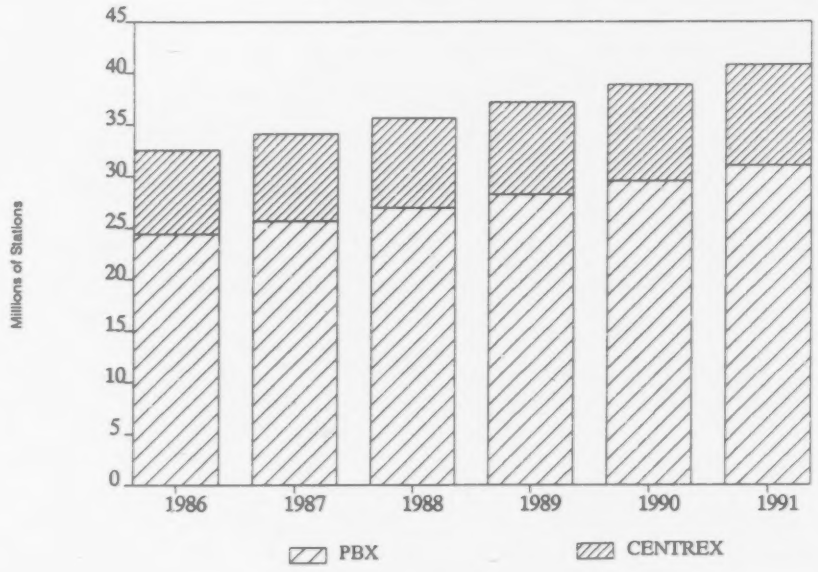
- Digital PBXs will make up between 80 to 90% of the installed base by 1991.

- In-place PBX systems had an average of 110 stations in 1986 and will have an average of 111 stations per system by 1991.

Centrex Installed Base

- The Centrex installed base grew 2.9% in 1986, to 8.17 million stations, and is projected at 8.4 million stations in 1987. The Centrex base will continue growing at a 3.8% compound annual growth rate between 1987 and 1991 to 9.8 million in 1991.

FIGURE 8
PBX & CENTREX STATIONS



Source: NATA

INSTALLED BASE: 1986-1991

Table VIII

PBX-CENTREX MARKET: 1982 - 1986
INSTALLED BASE DEVELOPMENT

	1982	1983	1984	1985	1986	1982-1986 CAGR*
PBX						
Bell Operating Companies						
Stations (000)	10,795	9,825	322	754	1,233	†
% Growth	3.3%	-8.9%	†	†	63.5%	
% Share	55.7%	47.4%	1.5%	3.3%	5.1%	
Independent Operating Companies						
Stations (000)	2,410	2,450	2,730	2,806	2,795	3.7%
% Growth	0.9%	1.7%	11.4%	2.8%	-.4%	
% Share	12.4%	11.8%	12.5%	12.1%	11.5%	
AT&T						
Stations (000)	N/A	800	9,910	9,524	9,137	†
% Growth		†	†	-3.9%	-4.1%	
% Share		3.9%	45.2%	41.1%	37.5%	
Interconnects						
Stations (000)	6,173	7,640	8,972	10,092	11,215	16.2%
% Growth	24.2%	23.8%	17.4%	12.5%	11.1%	
% Share	31.9%	36.9%	40.9%	43.6%	46.0%	
TOTAL PBX						
Stations (000)	19,378	20,715	21,934	23,176	24,380	5.8%
% Growth	8.6%	6.9%	5.9%	5.7%	5.2%	
PBX Systems (000)	181.1	191.8	201.2	212.6	221.6	5.1%
Average Stations/System	107	108	109	109	110	
CENTREX						
Stations(000)	8,001	7,814	7,846	7,942	8,172	.5%
% Growth	-5.8%	1.7%	0.4%	1.2%	2.9%	
TOTAL PBX & CENTREX						
Stations (000)	27,379	28,529	29,780	31,118	32,552	4.4%
% Growth	3.9%	4.2%	4.4%	4.5%	4.6%	

Source: NATA

*Compound Annual Growth Rate.

†Growth rates for the Bell operating companies (BOCs) and AT&T are not shown for 1984 because of the transfer of the embedded base from the BOCs to AT&T. Growth for the independent operating companies is artificially inflated in 1984 due to the shift of Southern New England Telephone (SNET) and Cincinnati Bell (CBI) into that category. Similarly, compound annual growth rates are not shown for the BOCs or AT&T because of distortions caused by the transfer of the installed base.

Table VIII

PBX-CENTREX MARKET: 1987 - 1991
INSTALLED BASE PROJECTIONS

	1987	1988	1989	1990	1991	1987-1991 CAGR*
PBX						
Bell Operating Companies						
Stations (000)	1,737	2,381	3,151	4,100	5,280	32.1%
% Growth	40.9%	37.1%	32.3%	30.1%	28.8%	
% Share	6.8%	8.9%	11.2%	13.9%	17.0%	
Independent Operating Companies						
Stations (000)	2,790	2,787	2,793	2,804	2,829	.3%
% Growth	-0.2%	-0.1%	0.2%	0.4%	0.9%	
% Share	10.9%	10.3%	9.9%	9.5%	9.1%	
AT&T						
Stations (000)	9,046	9,105	9,253	9,497	9,807	2.0%
% Growth	-1.0%	0.7%	1.6%	2.6%	3.3%	
% Share	35.3%	33.8%	32.8%	32.2%	31.6%	
Interconnects						
Stations (000)	12,084	12,678	12,998	13,129	13,105	2.0%
% Growth	7.8%	4.9%	2.5%	1.0%	-0.2%	
% Share	47.1%	47.0%	46.1%	44.5%	42.3%	
TOTAL PBX						
Stations (000)	25,657	26,951	28,195	29,530	31,021	4.8%
% Growth	5.2%	5.0%	4.6%	4.7%	5.1%	
PBX Systems (000)	232.2	242.8	254.0	267.0	280.5	4.8%
Average Stations/System	111	111	111	111	111	
CENTREX						
Stations (000)	8,423	8,693	8,997	9,361	9,778	3.8%
% Growth	3.1%	3.2%	3.5%	4.1%	4.5%	
TOTAL PBX & CENTREX						
Stations (000)	34,080	35,644	37,192	38,891	40,799	4.6%
% Growth	4.7%	4.6%	4.3%	4.6%	4.9%	

Source: NATA

"Installed base" refers to the cumulative total of equipment in use at the end of each calendar year. PBX stations are the equivalent of equipped lines. Centrex figures include all station equipment, both main stations and extensions, connected behind Centrex service.

The 22 wholly owned BOCs were divested by AT&T on January 1, 1984, and were regrouped into seven independent regional companies. At the time of divestiture the BOCs' installed base of approximately 9.8 million PBX stations was transferred to AT&T. Two companies historically counted as part of the Bell System, SNET and CBI, were not included in the AT&T divestiture and their PBX installed base was transferred to the "independent operating company" category in the 1984 column.

VENDOR MARKETS

Summary

The business telephone equipment market is experiencing consolidation, both in equipment manufacturing and distribution. In addition, the market is entering the beginning of a long-term shift in distribution toward AT&T and the BOCs. The predicted shakeout of marginal vendors, which began in earnest in 1985, continued through 1987, and appears likely to extend into 1988.

Current consolidation appears to be coming more through mergers and acquisitions than through business failures. By the end of the decade, those firms remaining in the market will realize higher sales volumes and improved profit margins.

Several factors, discussed below, favor long-term gains by AT&T and the BOCs at the expense of both interconnects and independent telephone companies. NATA projects that AT&T and the BOCs will account for over 57.1% of all new PBX and key/hybrid system sales by 1991--up from a combined share of 36.7% in 1986.

End-User Vendor Markets

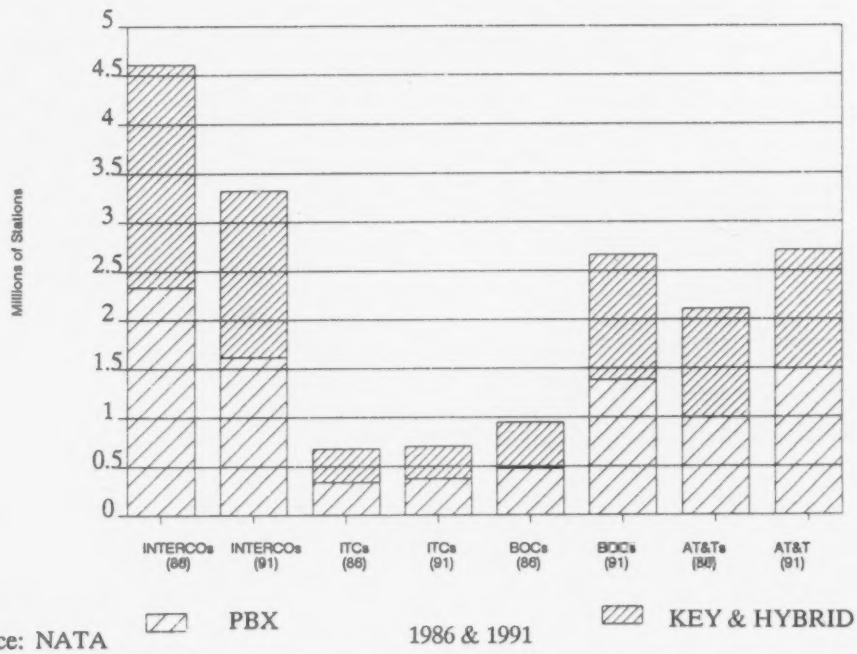
AT&T

Although AT&T's 100-year reputation for service and technological expertise contributes to its continuing dominance in the equipment market, the telecom giant seems to be struggling to develop an effective approach to marketing phone gear in a deregulated environment. Over the past several years, AT&T's equipment sales efforts have suffered from lack of a clearly defined marketing strategy, as evidenced by repeated corporate reorganizations. Recently, however, AT&T has instituted an aggressive retirement and lay-off program to streamline operations--the program is one of the largest in U.S. history and has resulted in the elimination of 32,000 employees. Additionally, AT&T has announced plans to integrate joint marketing of CPE and network services.

New System Sales

- AT&T's combined share of PBX, key, and hybrid equipment sales to users declined slightly from 27.3% in 1985, to 25.3% in 1986.

FIGURE 9
SALES TO USERS BY VENDORS



Source: NATA

- AT&T, despite chronic organizational and marketing problems, is expected to increase its market share of annual PBX, key, and hybrid systems sales from 25.3% in 1987 to 28.8% in 1991.

Installed Base

- AT&T's total installed base of PBX, key, and hybrid equipment declined slightly from approximately 48% of the total installed base in 1985 to 44% in 1986

- After AT&T's massive campaign to retain "embedded-base" customers (those whose equipment contracts with the BOCs were transferred to AT&T at divestiture), the telecom giant's revenues from equipment rentals have been shrinking at between 20 and 25% annually since 1984.

- AT&T's total installed base of PBX, key and hybrid equipment is projected to decline from 44% in 1986 to 35% in 1991.

Bell Operating Companies

Despite a slower-than-anticipated start in 1984 and recent poor performance, the BOCs have generally fulfilled expectations that they would become major players in the telephone equipment market, although some of the BOCs' competitors maintain that the Bells have yet to develop a coherent and consistent approach to pricing. The six BOCs who have indicated they will comply with FCC requirements for joint marketing of CPE and network services are well positioned for the future. Pac Tel, the only BOC overtly challenging the institution of third-party sales agency programs, is nevertheless zealously strategizing for joint marketing.

The BOCs have begun to purchase installed base and distribution channels, evidenced most clearly by Pac Tel's purchase of part of Northern Telecom's installed PBX base and the purchase of Universal Communications, a prominent interconnect vendor, by BellSouth in 1987.

New System Sales

- The BOCs' combined share of new PBX, key, and hybrid systems sales increased marginally in 1986, rising from 10.8% in 1985 to 11.4% in 1986.

- The BOCs are expected to show renewed growth in equipment sales. NATA predicts BOC shares will jump from 11.4% of annual new PBX, key and hybrid sales in 1986 to 28.3% by 1991. However, performance will vary among the various BOCs.

Installed Base

- The BOCs' total installed base of PBX, key, and hybrid equipment rose from approximately 3% in 1985 to slightly over 5% in 1986.

- The BOCs' total installed base of PBX, key, and hybrid stations is projected to increase from 4.8% in 1986 to nearly 16% in 1991.

Independent Telephone Operating Companies

Many independent telephone operating companies seem to be reevaluating their commitments to the business-systems market and are scaling back their marketing efforts. Apart from GTE, most independents would appear to be at a geographic disadvantage, with operating regions concentrated primarily outside major urban markets.

New System Sales

- The independent telco combined share of PBX, key, and hybrid sales to end users dropped from 9.6% in 1985 to 8.1% in 1986.

- The independent telephone operating companies, will see their share of annual new equipment sales slip from 8.1% in 1986 to 7.5% in 1991.

Installed Base

- The independent telco total installed base of PBX, key, and hybrid stations declined from nearly 12% in 1985 to slightly over 11% in 1986.

- The independent telco total installed base of PBX, key, and hybrid equipment will drop from approximately 11% in 1986 to slightly under 9% in 1991.

Interconnect Industry

Summary

The interconnect industry has been the primary beneficiary of initially uneven performance by AT&T and the BOCs, making market share gains in 1986 and early 1987. This trend, however, is not expected to continue beyond early 1988 as the BOCs and AT&T improve their joint marketing strategies for CPE and network services.

Currently, the interconnect industry is enduring a period of consolidation and retrenchment as market players respond to slowing industry growth rates. Events of 1986 and early 1987 point to a long-term shift in distribution. Manufacturers appear to be shifting distribution away from wholesalers and vendors toward manufacturer direct sales. The purchase of Tel-Plus by Siemens, the purchase of Jarvis by Isoetec, and the interest taken in AIM by NEC are but a few examples of the trend that is expected, over the next few years, to lead to an increased emphasis on direct sales.

The number of interconnect companies is decreasing. The tremendous influx of new vendors into the market in 1983 and 1984 was turned into an exodus in 1985 and 1986 because of business failures and acquisitions. The shakeout of marginal companies is expected to continue at least through 1987, making the vendor market much more concentrated by the end of the decade. This trend will lead to less intense price competition than that which has plagued the industry since 1984, and to a corresponding increase in aggregate profit margins. Individual interconnect vendors who remain in the market will have increased bargaining power with their suppliers as the pool of independent dealers shrinks.

New System Sales:

- Interconnect industry revenues from the sale of new PBX, key, and hybrid systems rose to $2.7 billion in 1986. This rise represented a 5.6% increase from 1985 levels.
- Interconnects will see their aggregate share of annual new PBX, key, and hybrid system sales drop from 55.2% in 1986 to 35.4% in 1991.
- Interconnect new system sales revenues are projected to continue declining at about a 5% compound annual growth rate between 1986 and 1991, as interconnects lose market share to other vendors, particularly to the BOCs.
- Despite the loss of market share predicted for interconnects as a group, many individual vendors will realize higher sales volumes and improved profit margins in the more concentrated market of the late-1980s.

Total Revenues

- Total interconnect industry revenues increased to $4.1 billion, rising 4.5 % over 1985 levels.
- Total interconnect industry revenues are expected to remain essentially flat through 1991, at about $4 billion annually.

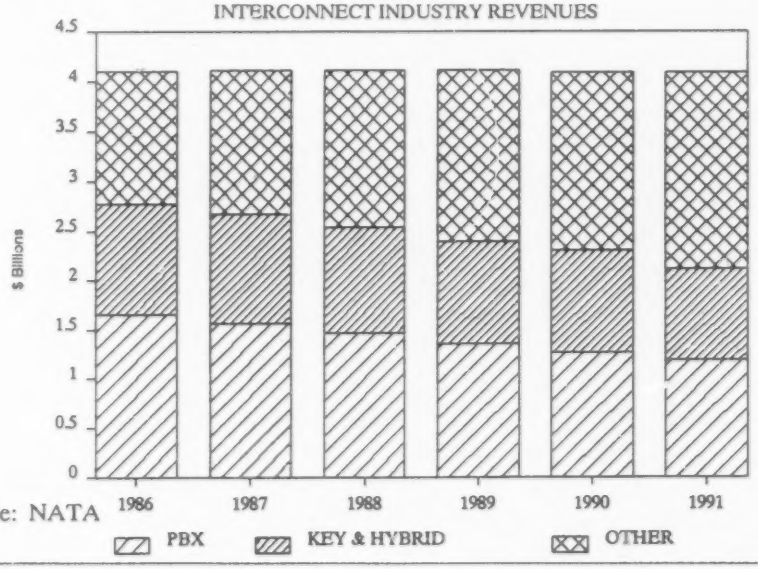
After-Market Revenues

- Off-setting interconnects' declining new-systems sales to some extent, will be a steady increase in revenues from post-sales activities--primarily moves, adds, changes, maintenance, sales of peripheral equipment, and value-added services to existing customers.
- In 1986, after-market revenues accounted for approximately one-third of all interconnect revenues.
- Post-sales revenues will grow at an 8.2% compound annual growth rate between 1986 and 1991, increasing from approximately 1.3 billion in 1986 to 2.0 billion in 1991.

Installed Base:

- Interconnect total installed base of PBX, key, and

FIGURE 10
INTERCONNECT INDUSTRY REVENUES



Source: NATA

Table IX

INTERCONNECT INDUSTRY ESTIMATED SALES AND REVENUES: 1984 - 1991

	Stations (000)	Sales ($ Mill)	Other ($ Mill)	Total Revenue ($ Mill)
1984				
PBX	2,134	$1,654		
KEY	2,777	1,307		
TOTAL		$2,961	$1,219	$4,180
1985				
PBX	2,130	$1,544		
KEY	2,202	1,090		
TOTAL		$2,634	$1,297	$3,931
1986				
PBX	2,334	$1,662		
KEY	2,271	1,120		
TOTAL		$2,782	$1,327	$4,109
1987				
PBX	2,215	$1,568		
KEY	2,258	1,111		
TOTAL		$2,679	$1,436	$4,115
1988				
PBX	2,075	$1,475		
KEY	2,162	1,070		
TOTAL		$2,545	$1,571	$4,116
1989				
PBX	1,905	$1,360		
KEY	2,064	1,042		
TOTAL		$2,402	$1,712	$4,114
1990				
PBX	1,755	$1,271		
KEY	2,064	1,042		
TOTAL		$2,313	$1,779	$4,092
1991				
PBX	1,617	$1,189		
KEY	1,822	931		
TOTAL		$2,120	$1,971	$4,091

Source: NATA

These figures show annual sales and service revenues for interconnects at the end-user level. Figures for key and hybrid stations include estimates for stand-alone installations and for "adjunct" equipment installed offerings behind PBX systems or Centrex Service. "Other" revenues are generated by service contracts, lease contracts, and other after-market activities to established customers. Figures represent industry averages, and actual prices-per-line and revenue ratios vary from company to company.

hybrid equipment rose from approximately 38.0% in 1985 to 41.0% in 1986.

- The interconnect industry total installed base of PBX, key, and hybrid equipment is projected to decline slightly from nearly 41% of the total base in 1986 to approximately 40% in 1991.

Vendor Strategies

Cost-Control Strategies

Emphasis on cost-control has pervaded every aspect of the average interconnect's operations, from inventory management and revised cost-accounting methods to new sales and marketing approaches.

- Interconnects have created purchasing and marketing consortia. Through these alliances, participating vendors have realized greater purchasing power, better manufacturer support, and higher market visibility than any one member could attain on its own.

- Centralized telemarketing campaigns for generating sales leads have provided economies of scale for participating vendors.

- Other cost-control initiatives have included the development of retail outlets as lower-cost alternatives to traditional sales calls on small-business customers. This strategy has had mixed success among vendors.

Acquisition Strategies

- Some interconnects have made a number of acquisitions. Through these purchases, vendors have sought to gain increased market presence in geographic and product areas in which they perceive opportunity.

Diversification Strategies

- Another successful market strategy, product-line diversification, has enabled an increasing number of established interconnects to position themselves in the more broadly defined office-automation market. By expanding their business definitions, interconnects have opened a new range of business opportunities for themselves.

- The much-discussed merging of telecommunications and data-processing technologies is reaching the marketplace. This shift in industry boundries is bringing with it opportunities for interconnects to supplement their traditional key and PBX product lines with new types of office-automation solutions.

- In addition to selling traditional voice-oriented application processors and peripherals, interconnects are actively marketing local area networks, modems, facsimile equipment, personal computers, and a wide variety of other data and data communications equipment. Most interconnects report favorable profit margins, and relatively low start-up costs associated with these types of products relative to voice-only equipment.

- Selling Centrex and other network services as authorized agents for local telcos allows some interconnects to enjoy the benefits of joint marketing of network services and CPE.

Niche-Market Strategies

- Some interconnects have concentrated on niche-market strategies to preserve a territory for themselves. Areas such as third-party maintenance and sales of peripherals have been overlooked by the larger players for quite some time.

Value-Added Strategies

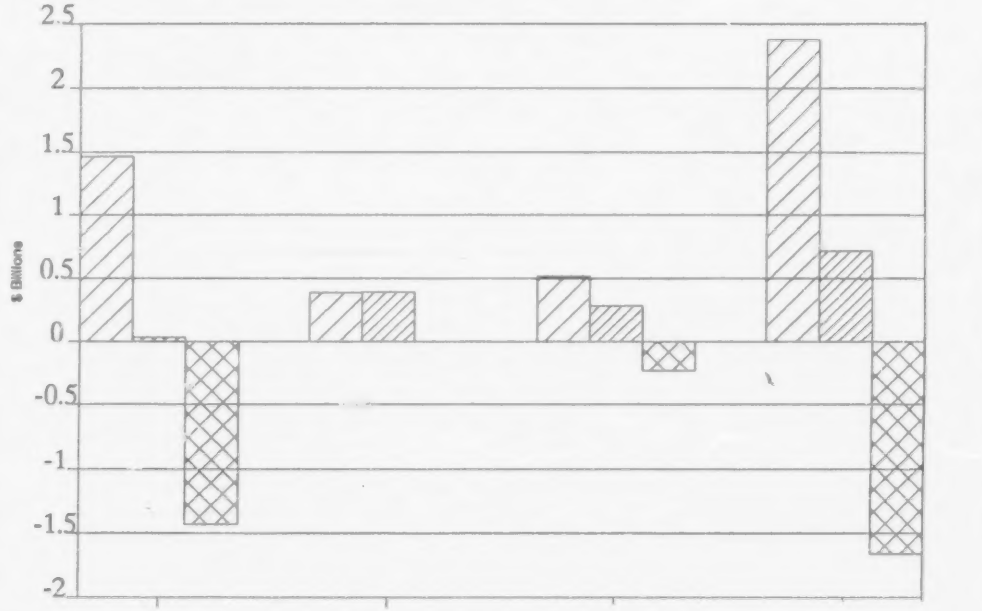
- Some interconnects have discovered the profitability of adopting a value-added strategy. By becoming "systems integrators", these vendors add value to the basic product thereby insulating themselves from fluctuating price levels.

Balance of Trade in Telephone and Telephone Switching Equipment

The U.S. trade deficit in telephones and telephone switching equipment reached record levels in 1986, approaching $1.7 billion. Declines in the relative value of the dollar should stimulate exports by making U.S. goods more attractive to foreign buyers. But, in 1986, exports were not sufficiently stimulated to counter-balance declining currency values. While exports did rise .43% in nominal terms, adjustments for inflation result in a marginal decline in U.S. exports in 1986. Imports, however, rose dramatically, increasing nearly 25% in nominal dollars over 1985 levels. The net effect was a nominal increase of nearly 40% in the U.S. trade deficit in telephone and telephone switching equipment.

While the overall trade deficit rose dramatically, there was mixed performance within the various product categories. Of the three categories tracked by NATA, imports rose in telephone instruments and parts, increasing by nearly 126% to almost $1.5 billion, up just under $700 million in 1985. The level of imports in switching and switchboard apparatus declined by 24%, and imports of other telephone apparatus declined by 30%. U.S. exports of switching and switchboard apparatus rose by nearly 9%, and telephone instruments by 1%. However, U.S. exports of other telephone apparatus declined by slightly over 9%, nullifying the effects of gains in the other two product categories.

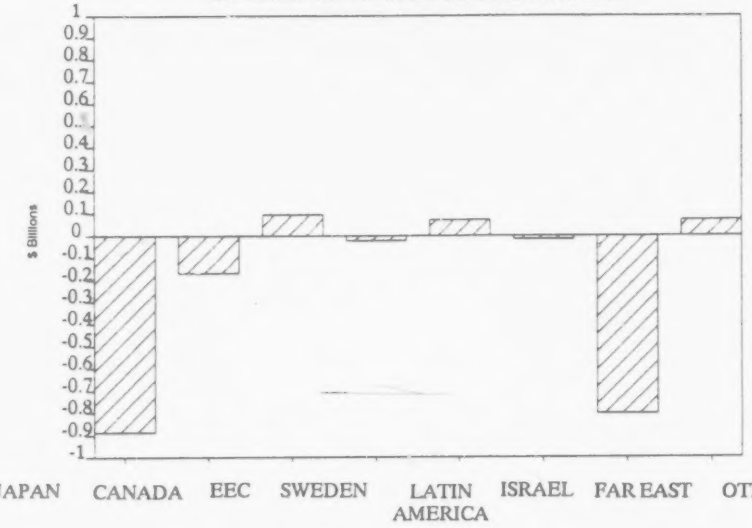
FIGURE 11
U.S. BALANCE OF TRADE: 1986



TELEPHONE & TELEPHONE SWITCHING EQUIPMENT

Source: NATA

FIGURE 12
U.S. BALANCE OF TRADE BY REGION: 1986



Source: NATA

TELEPHONE & TELEPHONE SWITCHING EQUIPMENT

The trade picture also varied by region. For 1986, Japan, still the single largest telecommunications trading partner with the U.S., had the largest trade surplus. That country's trade surplus with the U.S. approached $900 million, a figure that represented an 8.5% increase over 1985 levels. The U.S. deficit with the Far East (excluding Japan) more than doubled in 1986, rising to approximately $805 million. This increase can be attributed primarily to rising imports from Taiwan, Korea, and to a lesser extent, Hong Kong. The U.S. did enjoy a trade surplus, albeit minor, with three regions: the European Economic Community (EEC), Latin America, and the "other" category at approximately $96, $74, and, $72 million, respectively. The "other" category contains many less-developed nations as well as European nations that do not belong to the EEC.

Protectionist sentiments have been rising on the part of many U.S. policy makers throughout 1986 and early 1987.

- Over a dozen trade bills were introduced over the last 18 months, many requiring reciprocity on the part of countries that will not open their markets to U.S. firms.

- The FCC proposed to refuse Part 68 registration to equipment manufacturers from countries that have not sufficiently opened their markets to U.S. suppliers.

- The Senate attached an amendment to the "Omnibus Trade Bill" barring Toshiba and a Norwegian company from the U.S. market for 2 to 5 years as punishment for sales of sensitive military equipment to the Soviet Union.

NATA and others question the wisdom of implementing such protectionist policies, arguing that a more prudent solution to the problem would be concentrating on improving the competitiveness of U.S. firms and thus the competitive position of the United States. In testimony before the U.S. Congress, NATA argued that sanctions are irrelevant and that the real issue is how government and the private sector can work together to promote American competitiveness in world markets. NATA urged Congress to loosen export controls, beef up unit-dumping laws, protect U.S. intellectual property, permit more R&D joint ventures, and to continue to rectify exchange-rate imbalances. NATA also pointed out that trade barriers have decreased significantly in Japan and stated that the real problem lies in Western Europe where "snail-paced" reforms have slowed U.S. entry into these markets.

There has been some progress in assisting U.S. exporters in overcoming barriers to trade. Under the auspices of The U.S. Export Trading Company Act, The Commerce Department has begun to actively support U.S. firms that would like to trade abroad. This support is coming through a variety of programs that help locate trading partners as well as educate U.S. firms in international trading customs. NATA sees such measures, along with those listed above and the stepped-up commitment of resources by U.S. firms, as the best long-run solution to the U.S. balance of trade deficits.

Table X

U.S. BALANCE OF TRADE IN TELEPHONE AND TELEPHONE SWITCHING EQUIPMENT: 1986

	Switching and Switchboard Equipment	Telephone Instruments	Other Telephone Apparatus	TOTAL
Imports				
Japan	$160,595	$573,802	$225,555	$959,952
Canada	157,583	55,092	51,762	264,437
EEC*	10,473	35,753	12,729	58,955
Sweden	4,832	7,126	20,186	32,144
Latin America	25	16,628	13,764	30,147
Israel	13,217	3,845	14,818	31,880
Far East (exc. Japan)	44,610	763,266	177,366	985,242
Other	499	10,372	2,845	13,716
TOTAL	$391,834	$1,465,884	$519,025	$2,376,743
Exports				
Japan	$ 45,433	$ 2,338	$ 24,479	$ 72,250
Canada	46,129	7,560	41,025	94,713
EEC*	98,079	6,023	51,811	155,193
Sweden	1,993	163	6,401	8,557
Latin America	43,259	7,307	53,341	103,907
Israel	12,260	374	3,234	15,868
Far East (exc. Japan)	94,974	9,775	75,628	180,376
Other	52,215	4,004	29,090	85,309
TOTAL	$394,342	$ 37,544	$285,009	$716,895

Source: EIA, U.S. Department of Commerce

*EEC: The European Economic Community consists of Denmark, The United Kingdom, Ireland, The Netherlands, Belgium, Luxembourg, France, West Germany, Spain, Portugal, Italy, and Greece.

Exports: The dollar value shown is defined as the value at the U.S. port of export, based on the selling price (or cost if not sold), including inland freight, insurance, and other charges to the U.S. port of export. The value as defined, is equivalent to f.a.s. (free alongside ship) value, excluding the cost of loading the merchandise aboard the exporting carrier and excluding freight, insurance, and any other charges or transportation costs beyond the port of export. Figures do not include articles of metal manufactured in the U.S. which are exported abroad for further processing, and re-imported still requiring additional manufacturing (or processing) for completion. Also not included are articles assembled abroad, in whole or in part, from components produced in the United States, which have not been advanced in value or improved in condition except by operation incidental to the assembly process such as cleaning lubricating, or painting

Imports: The dollar value shown is defined as the market value in the foreign country (FOB) and therefore excludes U.S. import duties, freight charged from the foreign country to the U.S., and insurance. Figures include merchandise produced in foreign trade zones within the U.S.

APPENDIX

Table XI

VALUE COMPONENTS OF A TYPICAL PBX SALE

Switch Price to Buyer	60%
Installation	5%
Station Equipment	10%
Station Installation	12%
Battery	2%
Five-Year Service Contract	11%

Source: The Huber Report

Table XII

ANNUAL COST COMPONENTS OF A PRIVATE NETWORK

	Fraction of Total	Amount Paid to RBOCs and LECs*
Private Networks		
Switching Systems:	30-35	0
Private Lines:	6-8	4-7
Installation/Maint.:	5-7	1-2
Labor:	4-5	0
Subtotal	45-55	5-9
Off Networks		
IntraLATA Calls:	10-30	10-30
InterLATA Calls:	7-25	4-15
Off Net Equipment:	3-5	< 1
Other (Int'l. Telex):	4-6	0
Labor:	2-4	0
Subtotal	45-55	25-34
Total Expenditures	100%	30-43%

Source: The Huber Report, based upon analysis of customers with expenditures exceeding $10 million.

* Local Exchange Carriers

Table XIII

COSTS OF VOICE-MESSAGING VS ALTERNATIVE SERVICES

	Cost Per Message[1] Messages Per User Per Month				
	1	10	50	100	300
User-owned, PBX based					
25 Users	7.95	.80	.16	.08	.03
50 Users	36.16	3.62	.72	.36	.12
100 Users	27.93	2.79	.56	.28	.09
400 Users	11.09	1.11	.22	.11	.03
1,000 Users	6.39	.64	.13	.06	.02
2,000 Users	14.30	1.43	.29	.14	.05
8,000 Users	5.02	.50	.10	.05	.02
Answering Service[2]					
High Cost	73.50	7.35	1.47	.80	.43
Low Cost	33.50	3.35	.67	.40	.30
Indep. Service Bureau[3]					
High Cost	38.54	3.89	.81	.43	.26
Low Cost	12.49	1.56	.45	.25	.11
Answering Machine	3.20	.32	.06	.03	.01

Source: The Huber Report

[1]Assumes 1-minute messages

[2]Includes call forwarding, paid for by user.

[3]Includes call forwarding and transport charges, paid for by user. Assumes business user located in local calling area.

MANUFACTURERS' SHIPMENTS OF TELEPHONE EQUIPMENT TO CONSUMER MARKETS: 1982-1986

	CORDED		CORDLESS		CELLULAR		ANSWERERS	
	Units (000)	Value (Mil)	Units (000)	Value (Mil)	Units (000)	Value (Mil)	Units (000)	Value (Mil)
1982	3,700	200	2,000	200	N/A*	N/A*	850	110
1983	15,000	525	4,700	400	N/A*	N/A*	2,200	190
1984	24,000	790	6,300	460	N/A*	N/A*	3,000	230
1985	22,000	690	4,000	280	75	115	3,600	266
1986	24,100	795	4,400	315	150	185	4,900	350

Source: Electronic Industries Association

Value at factory level.

* Figures not available

U.S. BALANCE OF TRADE IN TELEPHONE & TELEPHONE SWITCHING EQUIPMENT: 1979 - 1986

	EXPORTS (000)	IMPORTS (000)	BALANCE (000)
1979	$344,200	$200,615	$143,585
1980	$428,743	$271,567	$157,176
1981	$523,523	$406,988	$116,535
1982	$677,841	$455,344	$222,497
1983	$670,879	$1,020,435	-$349,556
1984	$643,489	$1,956,651	-$1,313,162
1985	$713,820	$1,908,211	-$1,194,391
1986	$716,893	$2,376,741	-$1,659,848

Source: Electronic Industries Association, U.S. Department of Commerce.

Figures in Nominal Dollars

Exports: The dollar value shown is defined as the value at the U.S. port of export, based on the selling price (or cost if not sold), including inland freight, insurance, and other charges to the U.S. port of export. The value as defined, is equivalent to f.a.s. (free alongside ship) value, excluding the cost of loading the merchandise abroad the exporting carrier and excluding freight, insurance, and any other charges or transportation costs beyond the port of export. Figures do not include articles of metal manufactured in the U.S. which are exported abroad for further processing, and re-imported still requiring additional manufacturing (or processing) for completion. Also not included are articles assembled abroad, in whole or in part, from components produced in the United States, which have not been advanced in value or improved in condition except by operation incidental to the assembly process such as cleaning lubricating, or painting

Imports: The dollar value shown is defined as the market value in the foreign country (FOB) and therefore excludes U.S. import duties, freight charged from the foreign country to the U.S. and insurance.

GLOSSARY

Access Lines - any circuit from the telephone company's central office to a customer's premises. Also known as local loops

Adjunct Key system - A key telephone system installed behind a PBX system or to Centrex lines providing users with enhanced feature access and greater ease of use than standard single line sets.

After Market - Post-sales activities to existing customers

Analog Signals - Transmission signal that carries information in continuous, smoothly varying waves.

AT&T - American Telephone & Telegraph Company. AT&T owns the nations largest long-distance network. Prior to its court ordered divestiture in 1984, AT&T was the parent of the Bell operating companies. As of September 1985, AT&T was exempted from the FCC's separate subsidiary requirement, freeing the company to market equipment in tandem with its interexchange long-distance services. In the *NATA Statistical Review,* the term AT&T is used to refer, generically, to AT&T and its subsidiaries.

Bell Operating Company (BOC) - One of the 22 Bell Telephone companies whose primary business is providing local telephone service to customers. A BOC may market, but not manufacture new equipment. In the *NATA Statistical Review*, the term BOC is used, generically, to refer to all Bell Companies, including equipment subsidiaries, whether the subsidiaries is administered by a Bell Regional Holding Company or is an individual operating company.

Business Telephone Instruments - All telephones located on business premises, including single-line installations as well as phone sets associated with Centrex, PBX, and key systems.

CAGR - Compound Annual Growth Rate.

Centrex - A business switching service, provided exclusively by local operating companies using monopoly, central office switching equipment and outside plant as an alternative to PBX service.

Churn - The rate at which users replace installed equipment. On the average, churn is equal to the reciprocal of the estimated product life. Churn is generally expressed in one of two ways: as a percentage of annual shipments or as a percentage of the installed base of equipment that is replaced in any given year.

CPE - see Customer's Premises Equipment.

Customer's Premises Equipment (CPE) - Any apparatus (including telephone handsets, PBX switching equipment, key and hybrid telephone systems, and add on devices) which is physically located on the customer's property, as opposed to the telephone company's central office.

DID - see Direct Inward Dial.

Digital Signal - Transmission signal that carries information in a discontinuous stream of on/off pulses.

Direct Inward Dial (DID) - Centrex/PBX feature that allows an incoming call to reach a particular station without attendant assistance.

Electromechanical Equipment - Equipment that incorporates mechanical switches and relays rather than solid-state microprocessors.

Electronic Equipment - Equipment that incorporates solid-state microprocessor "chips" in place of mechanical switches and relays

Electronic Mail - Any communications service that permits the electronic transmission and storage of text messages.

Embedded Base - All Bell-supplied equipment in-place on customers' premises as of January 1, 1983. This equipment was transferred from the Bell Operating Companies to AT&T at the time of divestiture.

End-User Vendor - Those companies that sell equipment to, as well as, install and maintain it, for end-users.

FAX - see Remote Facsimile.

FCC-Federal Communications Commission - An independent agency authorized by the Communications Act of 1934, responsible for regulating interstate and foreign telecommunications.

Foreign Exchange Line (FX Line) - Connects user's location with the central office in a remote location, thereby, providing user with local service in remote exchange. Users in the remote location can also dial the FX number, which automatically rings in the primary location.

FX Line - see Foreign Exchange Line.

Gateway - An important characteristic of a LAN that allows it to interface with different transmission networks, particularly the public switched - telephone network. The interface mechanism provides special data translation

and conditioning functions for transmission compatibility between the networks.

Hybrid Key Telephone System - A multi-line telephone system that can combine the network-access characteristics of both traditional key systems and PBX systems.

Independent Telcos - Any of the approximately 1,400 local telephone operating companies not affiliated with the predivestiture Bell system.

Installed Base - Telephone equipment currently installed and in use.

Integrated Services Digital Network (ISDN) - The technical standards according to which the all-digital local exchange will be designed. ISDN will provide a high-speed, high-bandwidth channel to every subscriber on the telephone network, achieving end-to-end digital functions with standard equipment interface devices.

Integrated Voice-Data PBX - A PBX that simultaneously switches both voice and data signals. Integrated voice - data PBX's are often characterized by their ability to support digital telephone station sets.

Integrated Voice-Data Terminal (IVDT) - An instrument that includes a computer terminal keyboard/display and telephone and may contain some processing power.

Intercom - Communication between two or more telephone sets within the same telephone system.

Interconnect Industry - All non-carrier affiliated suppliers of business telephone equipment.

Interconnect Vendor - All non-carrier affiliated business telephone equipment vendors that market, but do not manufacture, equipment.

ISDN - see Integrated Services Digital Network.

IVDT - see Integrated Voice-Data Terminal.

Key Telephone System (KTS) - A multi-line telephone system designed to provide shared access to several outside lines through buttons, or keys, on the handset, typically offering identified line access with direct line-appearances or terminations on a given station set.

KTS - see Key Telephone system.

LAN - see Local Area Network.

Local Area Network (LAN) - a high speed data communications system with all aspects of the communications system controlled by a network operator. LANS typically permit the user to connect several diverse telecommunications and office-equipment functions into an integrated system.

OEM - see Original Equipment Manufacturer.

One-A-2 (1A2) - A generic name referring to an early, sparsely featured, electromechanical key system.

Original Equipment Manufacturer (OEM) - Company that manufactures equipment from components usually bought from other manufacturers

PBX - see Private Branch Exchange.

Pooled Access - A distinguishing characteristic of PBX telephone systems that allows the switch, when routing an external call, to seize an idle trunk from among a group of available CO Lines.

Private Branch Exchange (PBX) - A private telephone switching system located on a customer's premises. Both PBX and hybrid PBX systems provide pooled access to a group of access lines, typically by dialing "9" from an internal station set.

Private Line - A long distance circuit removed from the regular switched network and dedicated one hundred percent for a specific customers use.

Private Network - A network of private lines used by customers that have offices in several different locations.

Regional Holding Company (RHC) - One of the seven firms created from the AT&T divestiture, each of which acts as a holding company within a region of the United States for one or more of the 22 divested Bell operating companies, as well as for their unregulated subsidiaries.

Remote Facsimile - Technology that allows a paper message to be scanned optically, translated into digitally encoded pixels (patterns of tiny light and dark spots), and sent across the public telephone network to a receiving facsimile machine which reconstructs the original image.

Retail Market - The distribution channel - comprising such outlets as department stores, mail order catalogs, and household electronic shops - through which single line telephones and key telephone systems are commonly marketed.

RHC - see Regional Holding Company.

Single Line Installation - A business telephone instrument providing direct access to the telephone network and not connected to a Centrex, PBX or Centrex system.

Stand Alone - A key system directly connected to the telephone network, as opposed to one connected to a PBX or Centrex system.

Station - A telephone set connected directly to an outside line or an internal PBX line with its' own discrete number. This study measures stations roughly in terms of lines actually in use, not in terms of a systems capacity.

Stored Program Controlled - A type of switching system in which all system operations and features are controlled by computer programs.

System - An entire PBX, Key, or Centrex Installation, including all individual telephone instruments, wire, cable, common equipment (such as the switch for PBX and the main distribution frame for a key telephone system).

Telco - A common abbreviation for a telephone operating company.

Telephone Operating Company - A regulated company whose primary business is providing local telephone service to customers.

Trunk - A communications channel linking a central office with a PBX or other switching equipment.

Voice Mail - Sophisticated telephone voice messages that are recorded and translated into digital bits for storage and manipulation. Voice mail systems use specialized hardware and software and can be incorporated into a PBX or used as stand-alone systems.